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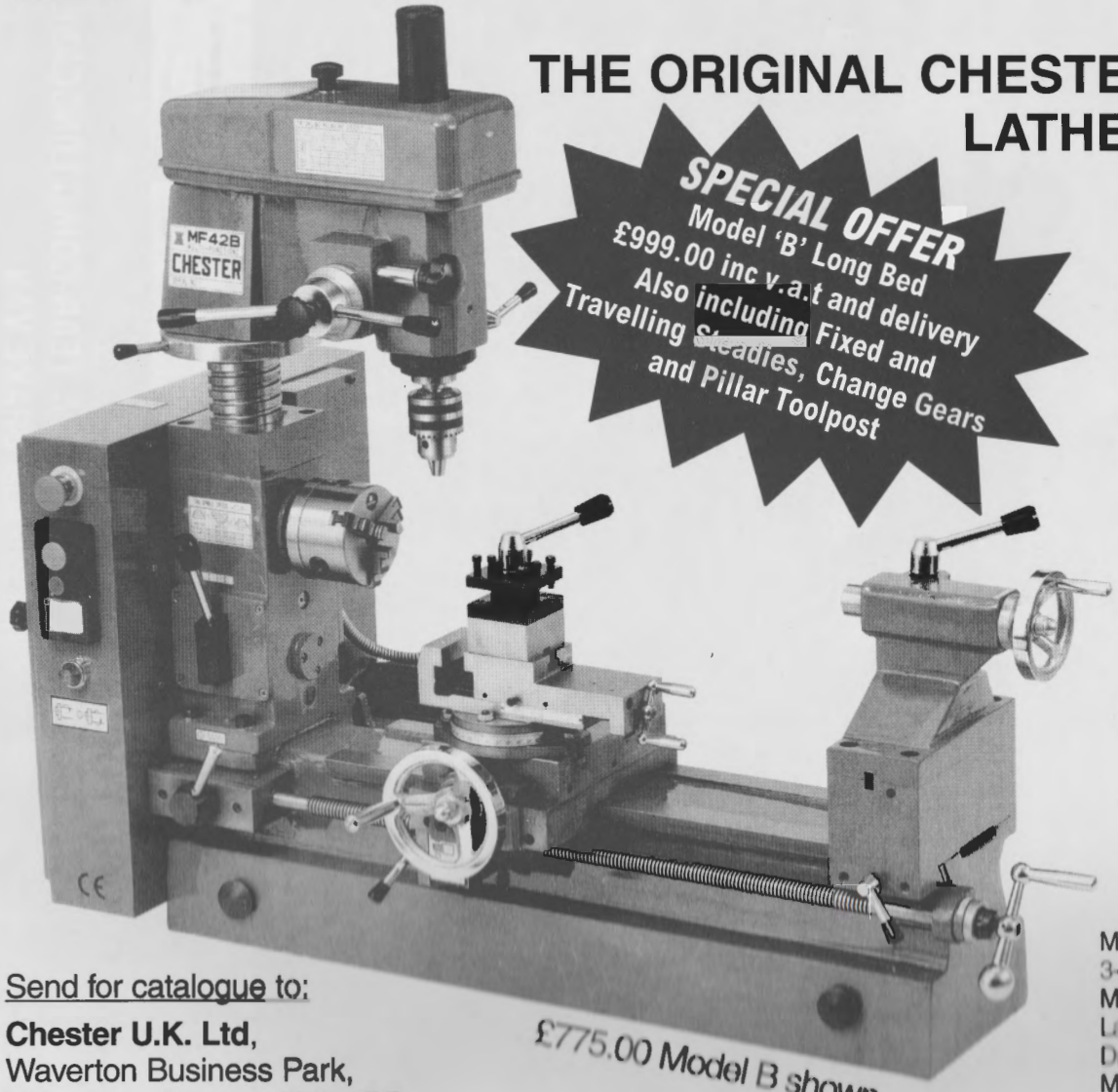

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VOLUME 19 No. 3 SEPTEMBER 1997

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COVER PICTURE

The six ton Foden steam wagon 'Dorset Wanderer' built as late as 1930 for road haulage and now owned by S E Davis & Son would certainly make an attractive model. The photograph was taken by Paul Stratford in September 1995 at Hanbury Traction Engine Rally.

IN NEXT MONTH'S ISSUE

Reuleaux's Trapezium Connecting Rod Engine
Constructing a Year-Going Longcase Clock
The Kerr Stuart Wren Class 0-4-0 Locomotive in 16mm
The Sheldon Compound Steam Engine
A Three Ton Double Acting Steam Hammer

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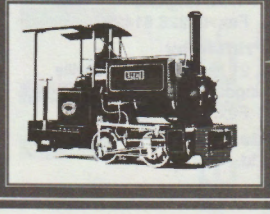

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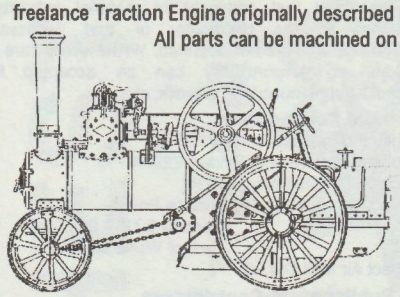

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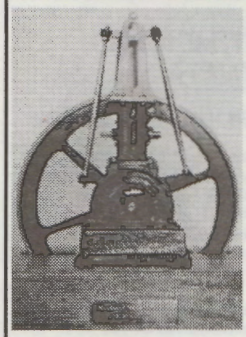

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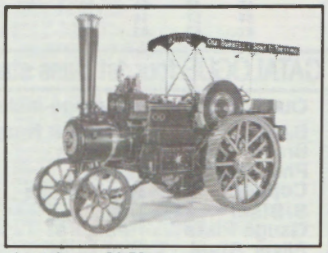

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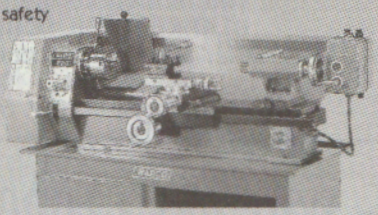

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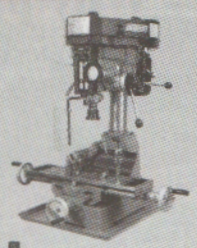

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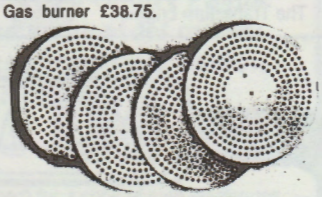

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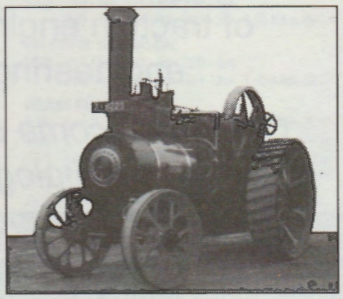

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Thiel 3/4"x8" Horizontal Milling Arbor, Thiel Taper (Unused)....£85.00
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Thiel Stub Arbor 1/2" or 5/8" (unused)....£35.00
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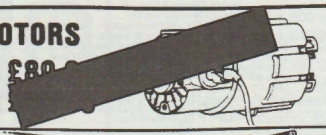

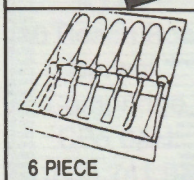

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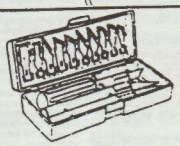

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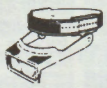

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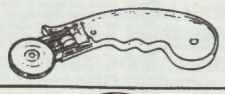

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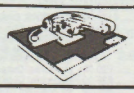

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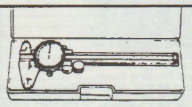

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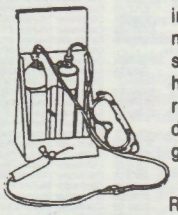

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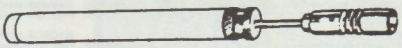

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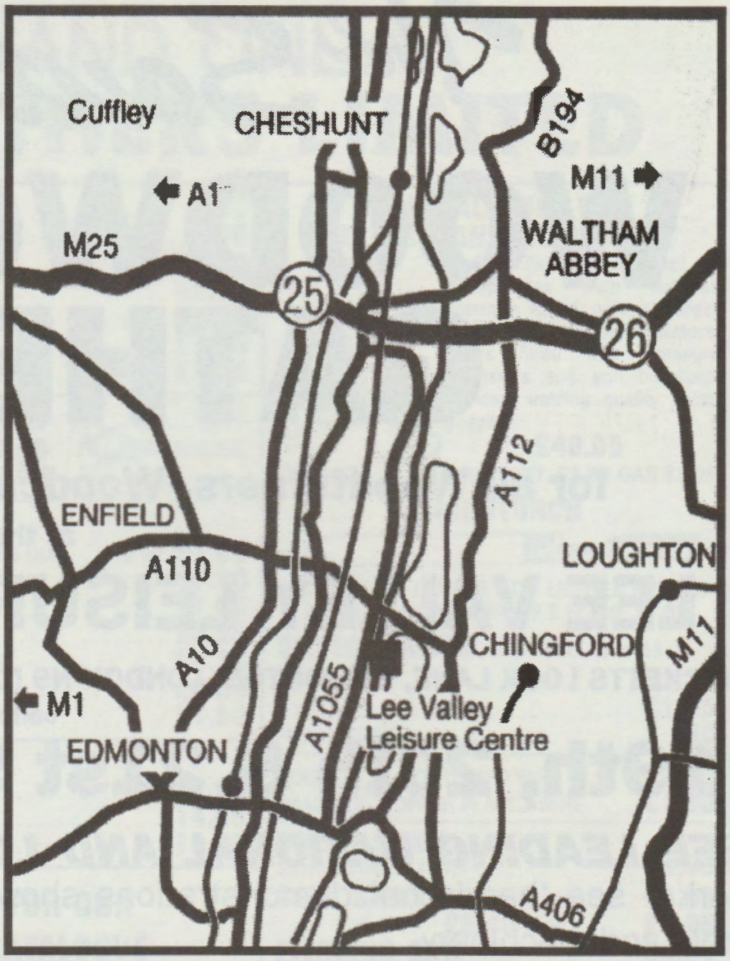
for Woodworkers in the South

The Southern WOODWORKERS GATHERING

HOW TO GET TO THE SHOW . . .



BY ROAD:

The Centre is just 20 minutes drive from the City of London, 15 minutes from the M25 and M11 road routes and a 5 minute drive to the A406 North Circular Road. Centre parking spaces are in abundance – 1,300 in total with 60 designated for disabled drivers.

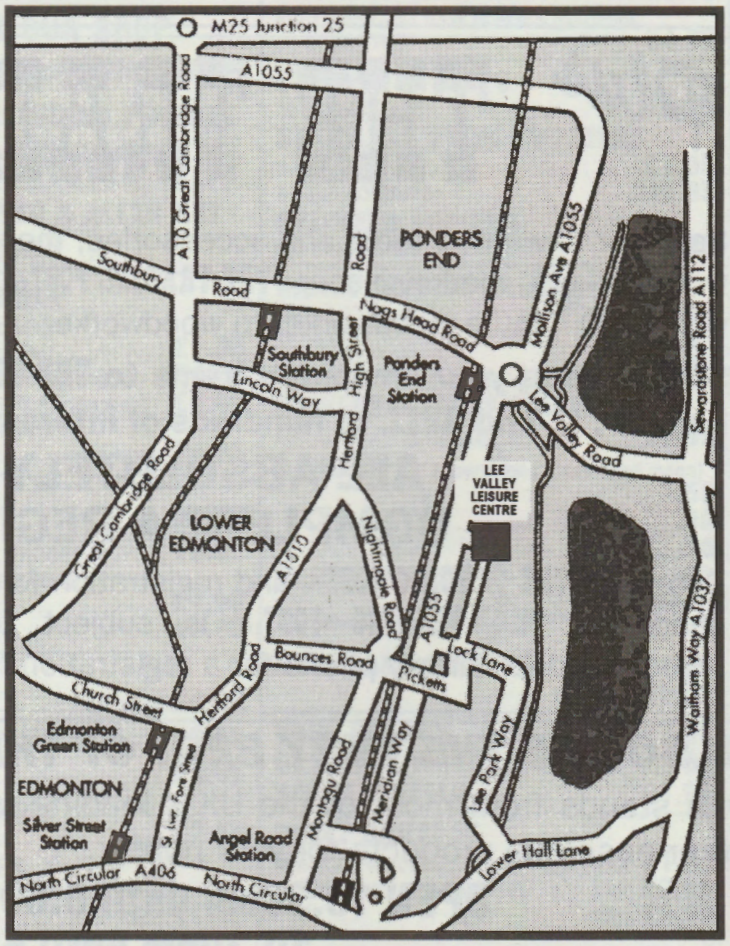
BY RAIL:

The Centre is on the West Anglia Great Northern line from Liverpool Street to Cambridge. Edmonton Green station is a short (W8) bus ride from the Centre. Alternatively, Lee Valley buses, route 363, run from Tottenham Hale Station (on the Victoria Line underground and the West Anglia Great Northern line) to the Centre at frequent intervals.

Nearby Ponders End station is open mid-week only.

BY BUS:

The W8 and 363 buses visit the Centre. The bus stop is located 100 metres from the front door.



AMPLE FREE CAR & COACH PARKING – 1,300 SPACES!

The Southern WOODWORKERS GATHERING

19th, 20th & 21st SEPTEMBER 1997

LEE VALLEY LEISURE CENTRE
MERIDIAN WAY (PICKETTS LOCK LANE)
EDMONTON, LONDON N9

Lee Valley Park

EDITORIAL

ANOTHER GREAT SHOW

We are now barely two months away from the largest event in the model engineering world. This is, of course, the Midlands Model Engineering Exhibition which will again be held at the International Exhibition Centre at Castle Donington. The 48,000 sq ft exhibition hall is one of the largest exhibition halls in the country, and probably the largest hall ever to be completely filled with model engineering exhibits.

We are pleased to have the continued support of so many model engineering societies and some of them are planning special features for visitors' enjoyment. The Ground Level 5" Main Line Association will be operating a larger marshalling yard than last year, while our good friends from the Steam Boat Association will also be present in strength. These two displays have been moved from their previous position in the centre of the hall last year to each end of the hall, thus giving them even more space to display their work.

We expect the number of models to be well up to the usual levels – nearly 800 model engineering exhibits are seen each year at the Midlands exhibition – and therefore it is a pilgrimage that really needs to be made! There are other exhibitions, but the Midlands Model Engineering Exhibition remains not only the largest exhibition devoted almost exclusively to model engineering, but also at eight days the longest running. Furthermore, it is supported by more clubs and societies than any other exhibition. More model engineering exhibits are displayed and you will find nearly all the leading suppliers present. It is the one exhibition where you can meet virtually everybody connected with the hobby.

Last year there was a comment in one of the association newsletters that another exhibition was worth seeing because, for one thing, there were people to talk to and they compared this to the unattended 'serried ranks' of models at other exhibitions. Perhaps it might have been the Midlands exhibition they were referring to, because we *do* have rank upon rank of models and we do display what we advertise – hundreds of models, nearly 800 in all! However, whilst the occasional club display may not be stewarded, there are on average over 100 stewards in the hall every day plus other volunteers, so it is certainly not a case of no-one to talk to at our exhibition. A visit to the exhibition is not only a visit to see the models, it is an important opportunity to renew old acquaintances, see the latest products, talk to your favourite trade suppliers and meet your friends. If you visit the Midlands exhibition you are guaranteed to meet more fellow enthusiasts, more friends, more acquaintances from year to year than at any other show. The Midlands Model Engineering Exhibition is more than just an exhibition, it is a day out in the Mecca of model engineering, so make sure that you don't miss this year's show from the 18th-25th October at Castle Donington near Exit 24 of the M1 near Derby.

THE SHOW THAT DELIVERS

Over the years, we have always tried to get the maximum number of models displayed and to ensure that the exhibition lives up to both the advertising and what you, the visitor, expects. Other events advertise 1,000s of models and, when one talks of thousands, you actually think of terms of 3,000 to 4,000. Yet when you arrive you are more likely to find hundreds instead of thousands and frequently this sort of advertising misleads visitors – particularly irritating if you have travelled a great distance or are from overseas.

Those who have visited the Midlands exhibition will know that it is an exhibition devoted almost solely to our hobby and that when we advertise the number of models on display, it is as accurate as we can possibly be. We have never claimed thousands of models, nor would we – that sort of wild advertising is for others. We prefer to be more accurate.

Talking of advertising, we would like to ask all our readers to mention and, if possible, pass on the information about the Midlands Model Engineering Exhibition to their friends and acquaintances and to clubs, evening classes, etc. The reason for this request is that in December of last year, after we launched the highly successful London Model Engineer's Gathering, all our advertising in our contemporary *Model Engineer* was withdrawn without notice and, at the time of writing, since that time we have been unable to secure further advertising. Whilst this is unfortunate, it has far reaching implications in that it deprives its readers and model engineers everywhere of knowledge of events, publications or other information which they may wish to know. So please pass the word to all you meet that the model engineering world's largest event will again take place at Donington from the 18th-25th October. We look forward to seeing you there.

PAINTING YOUR MODEL

Having spent years of work building a scale model, the next task is to complete the job with the most accurate paint finish possible. In this respect, we are fortunate that Rob Shephard has re-entered the enthusiast market with the Phoenix Precision Paint Company which now, with its recent acquisition of Cherry Paints from Micrologica Systems Ltd, has a total range available in excess of 550 shades.

Phoenix is unique in that they make their own paint so that total quality control is in the company's own hands. The company uses state of the art computer equipment to ensure colour matching is accurately controlled from batch to batch, and this facility will now extend to the Cherry Paints range as well. Phoenix not only supply colours for the original railway companies such as the GWR, LNER and so on, but they are also up-to-date on the privatised companies with colours for EW&S, GNER, Virgin Trains and Midland Mainline. All these colours are part of the largest range of authentic model railway, bus and traction engine colours ever offered. The company can draw on 25 years of experience in researching British liveries and over 20 years of manufacturing paints.

To get an accurate colour and superb finish to your model, it is well worth looking at the range offered by Phoenix.

THE SIMPLEX RALLY

The Newport Model Engineering Society will be holding its Simplex Rally over the weekend of 6th & 7th September. The idea is to have a fun weekend using this very popular design of steam engine exclusively. Two awards will be made, one for the best overall Simplex, to be known as the Supreme Champion Simplex, and one for the most unusual variation on the theme. Engines will be expected to haul passengers or their equivalent weight around the Newport Society's nearly ¾ mile long track. Camping and caravan facilities are available and all visitors will be warmly welcome. If you have a Simplex and want to take part, give Jeff Rodway a ring on 01633 871427.

BRISTOL EXHIBITION

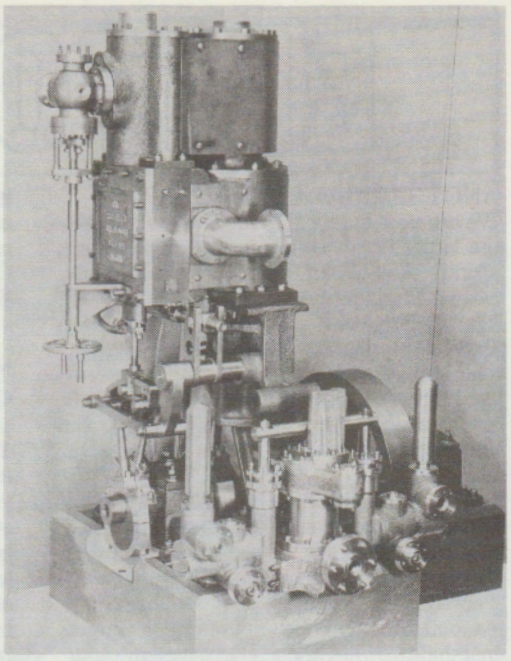
The Bristol Society of Model and Experimental Engineers will be holding an exhibition at the Brunel Centre in Bristol from the 26th–28th September. The Society tends to organise a major event every ten years and on this occasion the venue is the original Temple Meads station in central Bristol. After admiring the many exhibits, you will be able to raise your eyes to the magnificent hammer-beam roof constructed over 150 years ago and visualise the broad gauge trains standing at the platforms. The exhibition will be open from 10am–9pm on the Friday, 10am–6pm on the Saturday and 10am–5pm on the Sunday.

MODEL ENGINEERING COURSE

The extensive list of evening classes, seen in model engineering journals years ago, has long since disappeared and it is only where a lecturer has a particular interest in model engineering that one sees classes offered. Leek College of Further Education has a model engineering class every Thursday evening and the next course starts this month. For more information about the course, you should contact either Joe Richardson or Colin Brunt on (01538) 398866. There are a number of model engineering projects in hand and the college workshop is particularly well-endowed with no less than eleven lathes, six milling machines, four shaping machines, plus various other equipment.

THE SHELDON COMPOUND STEAM ENGINE

John P Bertinat



Part Fifteen

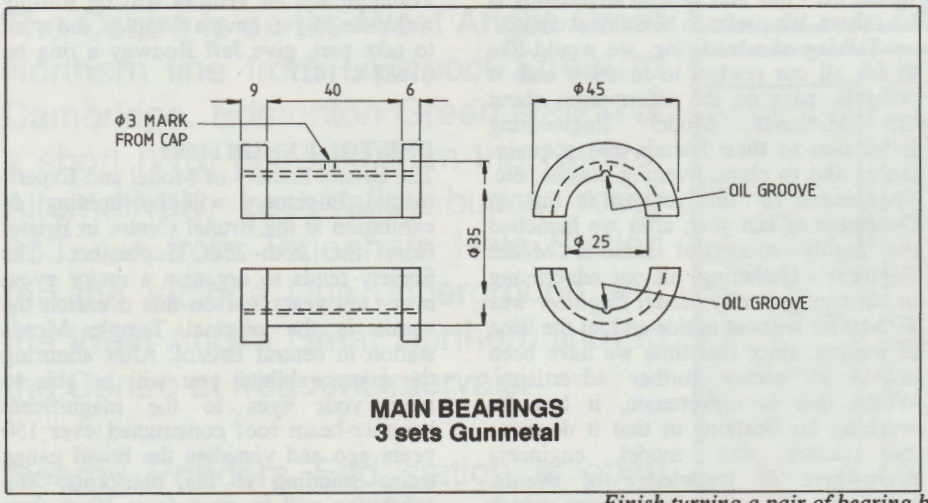
Bearing Brasses

Each of the three main bearings is supplied as two separate castings and the first job is to clean up the joint faces either by shaping or by milling. The two halves of each bearing are tinned and soft soldered firmly together, squeezing the joint together with tongs so as to keep the film of solder as thin as possible. The bearing is then gripped firmly in a four-jaw chuck, the outer end faced, the outside of the projecting flange skimmed and the casting carefully bored to an easy fit on the crankshaft. Do not be tempted to use a reamer to finish the bore – the soldered joint and the grip in the four-jaw chuck might give way! The casting is now reversed in the chuck, gripping more securely by the now machined flange and faced to length.

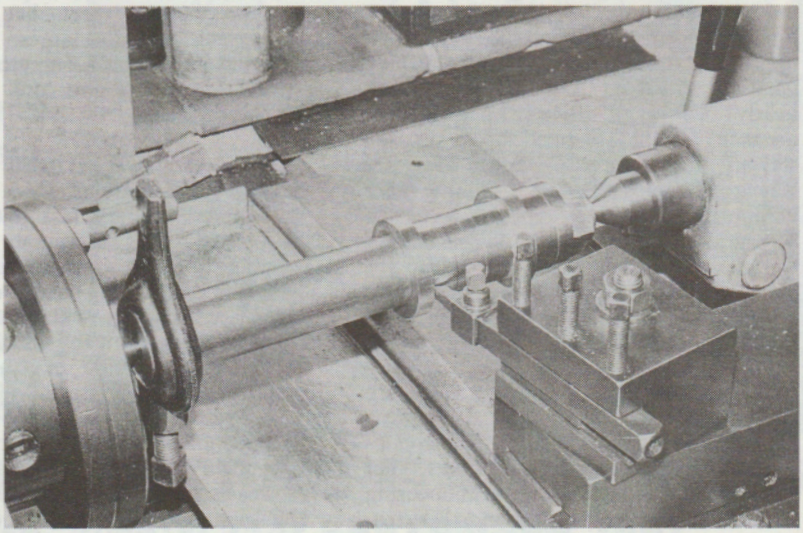
To finish the outer surface, the casting is located by a mandrel in its finished bore. To avoid the risk of failure of the soldered joint during the finishing process, I prefer to use a screwed and nutted mandrel (similar to that used to hold a milling cutter) so that the work is clamped by its end faces only. This finishing operation is shown in my photograph – note from the photograph that the central part of the bearing is relieved slightly. Although not shown on the drawing, I added an anti-rotation pin to each bearing. For this purpose. the 3mm diameter oil hole drilling from the bearing cap was continued right through the bottom half of the bearing and extended to a depth of 5mm into the main base casting. A brass peg 3mm diameter and about 7mm long will lock the bearing in place and will itself be held in position by the crankshaft.

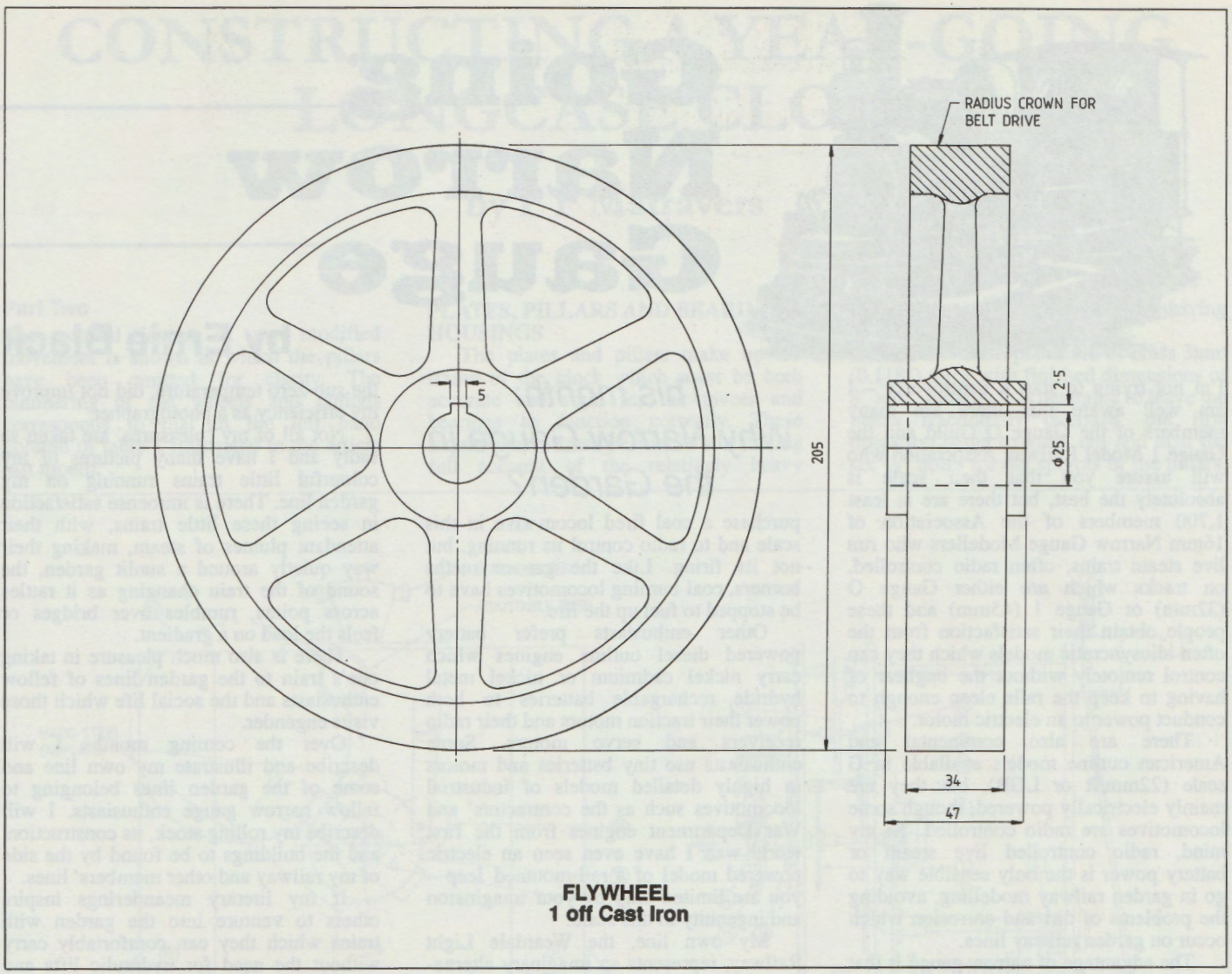
Flywheel

As builders will by now have become accustomed to dealing with heavy castings, the machining of the flywheel should present few problems. The bulk of the work can be carried out at the single setting shown in the photograph. Note that the casting has been packed out from the faceplate in order that the whole face of the rim could be machined. and that the clamps are placed as close as possible to the rim to minimise any clamping stresses in the spokes. Both rim and boss (including boring for the shaft) are dealt with at this setting and the casting is simply reversed on the faceplate (or mounted on a mandrel) to deal with the other side. In the absence of a slotting attachment, the recognised method of cutting keyways is to plane them from the topslide of the lathe while the work is held in a chuck or on a faceplate with the mandrel locked. If this method is used, it is safer to support the wheel boss directly against the tool thrust since, if the work is supported at the rim only, there is a risk of distorted or broken spokes as tool forces with a 5mm wide parting tool can be high. I actually have a slotting attachment for the M1 miller and the work is set up with the wheel boss resting firmly on the machine table, clearance for the cutting tool being provided by the central slot in the machine table. The photograph

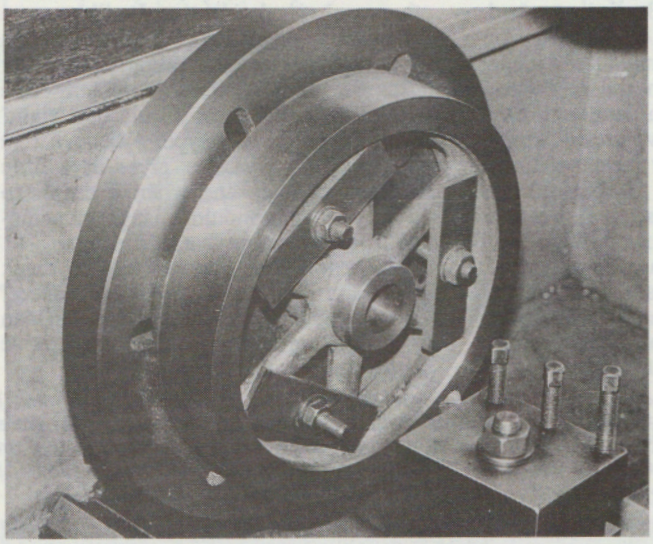


Finish turning a pair of bearing brasses mounted on a nutted arbor where pressure can be applied to the end faces.





FLYWHEEL
1 off Cast Iron



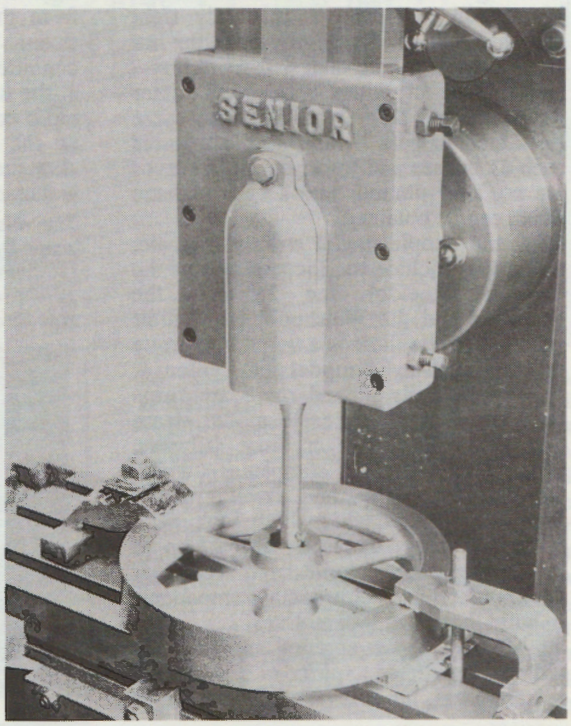
Left: With careful setting on the faceplate all the surfaces of the flywheel except the backface can be fully machined in the first operation.

(right) shows the operation in progress. The work load was actually arranged so that the keyways in the eccentric sheaves could be cut at the same setting – necessary in order to justify the time and effort required to hoist the slotting attachment into position!

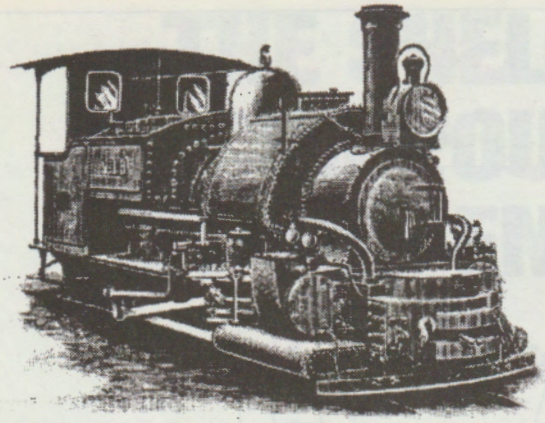
Note re Commander

Since the Commander engine was designed as a marine engine. it was fitted with a more compact disc flywheel and, in place of the outboard bearing, a ball bearing thrust block was included. The full description of this feature would be rather an intrusion at this stage, but if there is interest, I will include some relevant material at the end of the series.

To be continued.



Right: Machining the keyway in the flywheel boss using the slotting head on the milling machine.



Going Narrow Gauge

by Ernie Black

This month: Why Narrow Gauge in the Garden?

I'm not trying to start a controversy – I am well aware that there are many members of the Gauge O Guild and the Gauge 1 Model Railway Association who will assure you that their scale is absolutely the best, but there are at least 1,700 members of the Association of 16mm Narrow Gauge Modellers who run live steam trains, often radio controlled, on tracks which are either Gauge O (32mm) or Gauge 1 (45mm) and these people obtain their satisfaction from the often idiosyncratic models which they can control remotely without the bugbear of having to keep the rails clean enough to conduct power to an electric motor.

There are also continental and American outline models available in G scale (22mm/ft or LGB), but they are mainly electrically powered, though some locomotives are radio controlled. To my mind, radio controlled live steam or battery power is the only sensible way to go in garden railway modelling, avoiding the problems of dirt and corrosion which occur on garden railway lines.

The advantage of narrow gauge is that a much larger and more powerful locomotive results from modelling in the 16mm/ft scale. The tracks are the same as for the smaller scales but the rolling stock is more than twice the size of Gauge O (7mm/ft) and more than half as big again as Gauge 1 (10mm/ft). Because wheelbases tend to be short, relatively tight curves can be tolerated – my own line has some curves of less than 4 ft 6" radius – and I know of others with even tighter radius curves than 3 ft! Because these lines tend to pass behind scenic features such as bushes and trees, the tight curves are not very obvious and a very realistic effect can be obtained.

Some people model strictly to scale; prototypes include the locomotives of the Vale of Rheidol, the Talyllyn, the Festiniog and the Welshpool & Llanfair railways, while there is a very large group of enthusiasts who model the Lynton & Barnstaple Railway and there are firms who will sell you a scale model steam locomotive from any of those railways. There are several companies which produce powerful and well proven freelance engines which both look good and run superbly. There are also the home builders who either build from scratch or who buy and use commercial components to build their own locomotives.

Most of these engines are fired by either methylated spirit or by liquid petrolum gas, but it is possible to build or purchase a coal fired locomotive in this scale and to radio control its running, but not its firing. Like the gas or meths burners, coal burning locomotives have to be stopped to fuel up the fire.

Other enthusiasts prefer battery powered diesel outline engines which carry nickel cadmium or nickel metal hydride rechargable batteries to both power their traction motors and their radio receivers and servo motors. Some enthusiasts use tiny batteries and motors in highly detailed models of industrial locomotives such as the contractors' and War Department engines from the first world war. I have even seen an electric powered model of a rail-mounted Jeep – you are limited only by your imaginaton and ingenuity in this scale!

My own line, the Weardale Light Railway, represents an imaginary alternative to the closure, in 1963, of all standard gauge rail services in the Wear Valley of County Durham. It forms an attractive feature in my garden, even in winter when there are drifts of snow on the line. I have a pair of working snowploughs which have actually cleared four inches of snow from the line, propelled by one of my steam locomotives. Alas, the weather conditions were not good for photography at the time and I found that operating the radio control and camera at the same time as the little engine charged the drifts, slithered to a standstill and then reversed and charged again, whilst I slowly froze in the sub-zero temperature, did not improve my efficiency as a photographer.

Not all of my 'pleasures' are taken so sadly and I have many pictures of my colourful little trains running on my garden line. There is immense satisfaction in seeing these little trains, with their attendant plumes of steam, making their way quietly around a sunlit garden, the sound of the train changing as it rattles across points, rumbles over bridges or feels the load on a gradient.

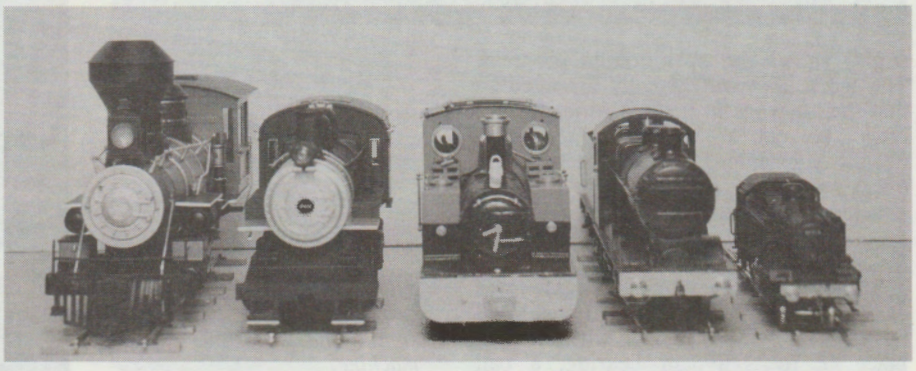
There is also much pleasure in taking one's train to the garden lines of fellow enthusiasts and the social life which those visits engender.

Over the coming months I will describe and illustrate my own line and some of the garden lines belonging to fellow narrow gauge enthusiasts. I will describe my rolling stock, its construction, and the buildings to be found by the side of my railway and other members' lines.

If my literary meanderings inspire others to venture into the garden with trains which they can comfortably carry without the need for hydraulic lifts and other mechanical aids, then I will be more than happy, even though I also model in the larger, passenger hauling scales. My tastes are very catholic. I do not subscribe to the theory that there is only one 'right' scale, gauge or prototype. I believe that we should do whatever gives us a little harmless pleasure and when it ceases to do so, then we should change to something which restores that fulfilment.

In conclusion, I would like to thank Bachmann Industries UK Ltd, Geoff Fearnley and Brian Harland for the loan of their locomotives for the comparative photograph.

The relationship of gauge and scale – from left, a Bachmann 45mm gauge, 1:22 (14 mm/ft) scale Denver & Rio Grande locomotive; an Aristocraft switcher in 45mm gauge, 1:29 scale (10.5mm/ft); a 16mm/ft (1:19 scale) Roundhouse narrow gauge 'Lady Anne' locomotive on 32mm (O gauge) track; a Gauge 1 (10mm/ft) 1:30 scale 'Project' and an O gauge (7mm/ft) standard gauge tank engine. All of these engines are eminently suitable for garden railways.



CONSTRUCTING A YEAR-GOING LONGCASE CLOCK

by F P Matravers

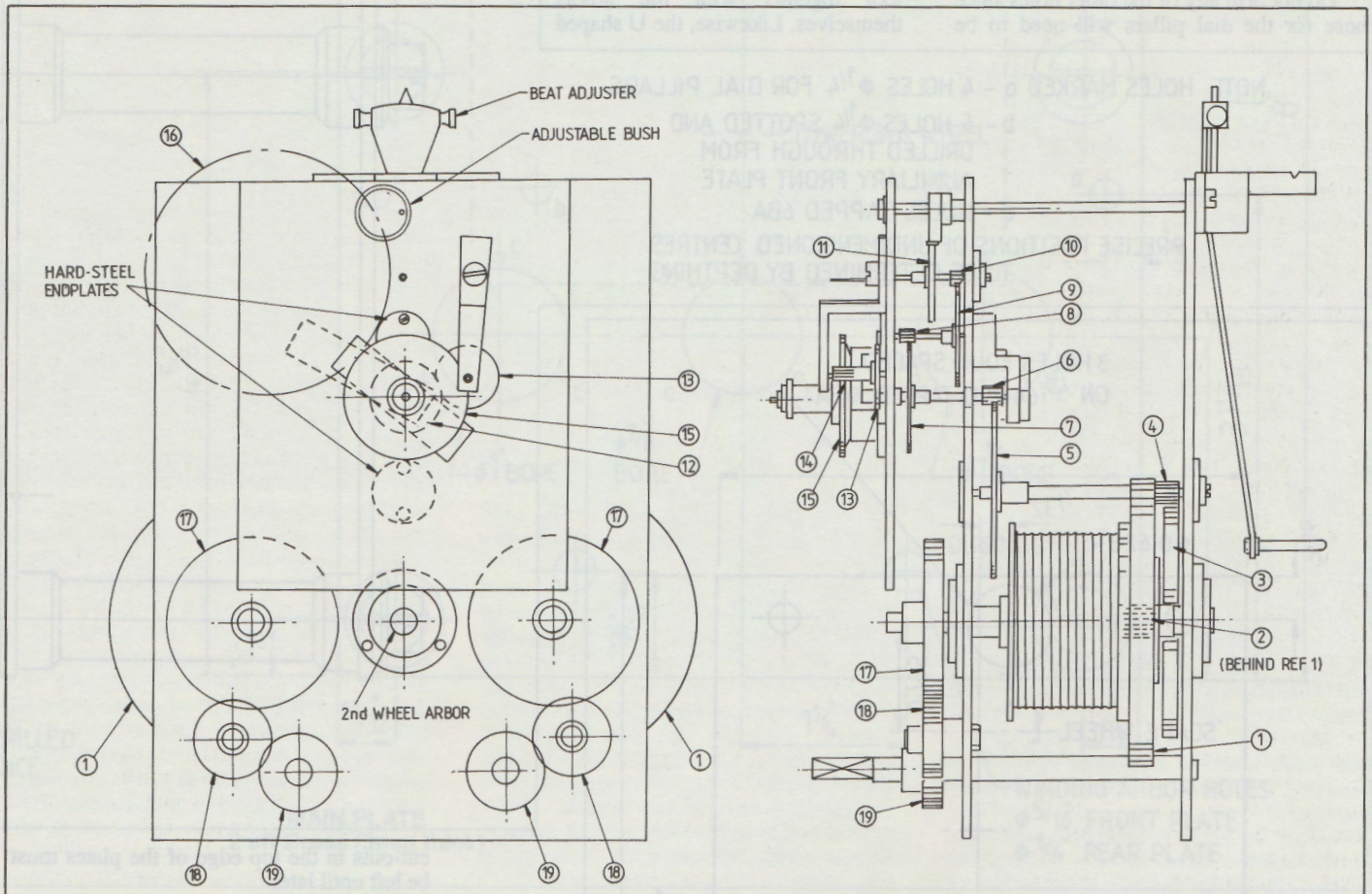
Part Two

The general layout of my modified movement is shown in which the pillars have been omitted for clarity. The numbering of the wheels and pinions corresponds to that in the left hand column of table 1 illustrated in the article last month.

PLATES, PILLARS AND BEARING HOUSINGS

The plates and pillars make up the frame of the clock which must be both accurate and rigid for the pivots and bearings to function correctly. These requirements must be met whilst taking full account of the relatively heavy weights that will be hung on the driving barrels.

The two main plates are of brass 3mm (0.118") thick with finished dimensions of 8" × 6". Initially it is desirable to leave the plates fractionally oversize, the first operation being to mark out and drill the six 3/8" holes for the spigots of the pillars.

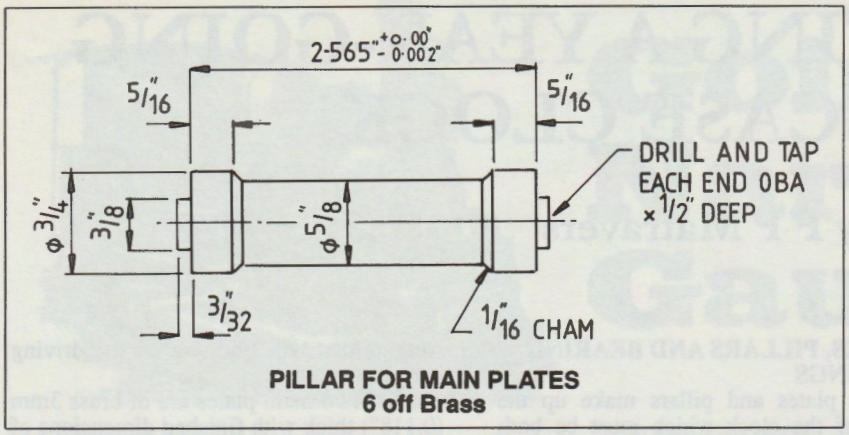


LAYOUT OF YEAR MOVEMENT

TABLE 3
CALENDAR WHEEL AND PINION DATA
Dimensions in inches

Ref.	Tooth Count	D.P.	P.C.D.	Full Dia.	Thickness	Pinion Bottom Dia.	Pinion Tooth Thickness	Description
20	7			0.5	3/32			Day of Week Ratchet
21	31			1.44	1/16			Date Ratchet
22	10	72	0.139	0.165		0.085	0.017	Date Ratchet Pinion
23	100	72	1.389	1.427	3/64			Intermediate Wheel
24	120	72	1.666	1.703	3/64			Year Wheel (follower)
25	36	72	0.5	0.538	3.64			Year Wheel (driver)
26	144	72	2	2.038	3/64			4 Year Wheel

To ensure that both plates will align accurately, they should be clamped together and one of the corner holes drilled and reamed to size, right through both plates. A close fitting peg turned from steel or brass is then inserted before drilling and reaming the diagonally opposite hole into which a second peg is inserted. With the two plates thus held in register, the remaining four holes are made and the plates then trimmed to their final dimensions. Particular attention should be given to the bottom edges of the plates to ensure that they align



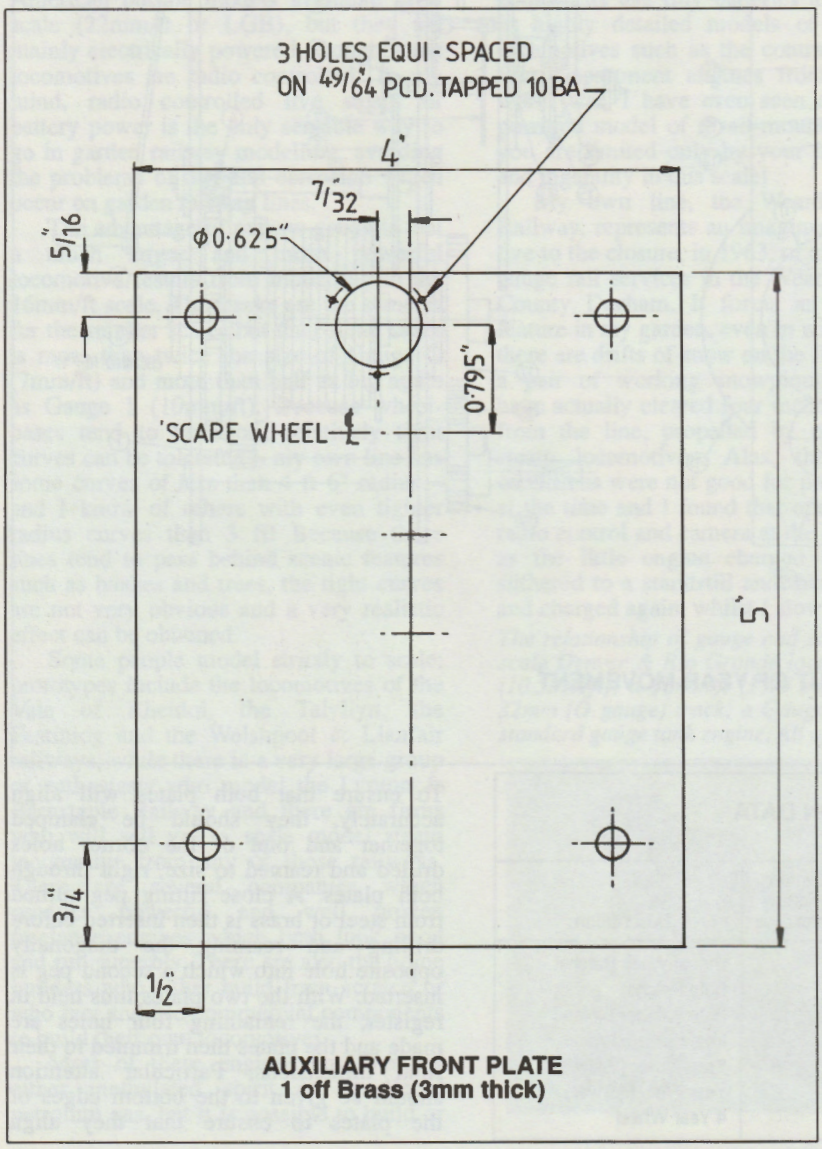
PILLAR FOR MAIN PLATES
6 off Brass

accurately with one another. The locating pegs should be retained beyond this stage as they will be required for later operations.

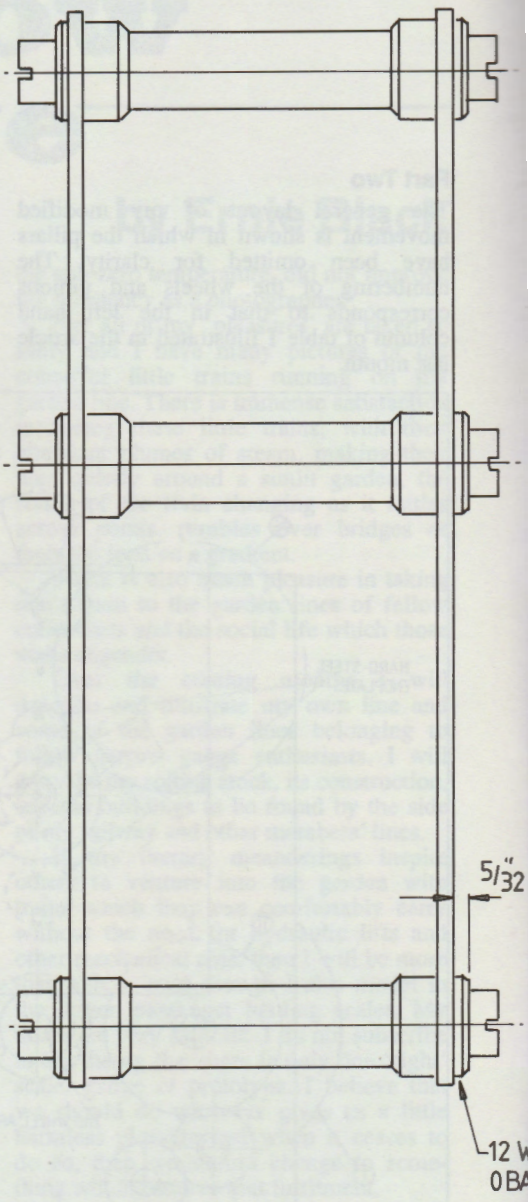
Do not drill any of the other holes since those for the dial pillars will need to be spotted through from the dial itself and the precise positions of those for the various arbors are established by use of a depthing tool together with the arbors themselves. Likewise, the U shaped cut-outs in the top edge of the plates must be left until later.

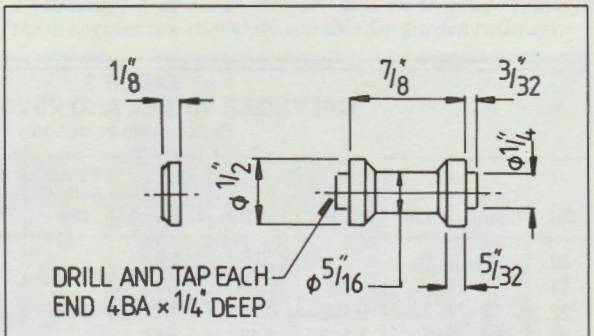
The six pillars are necessarily substantial and are turned between centres from 3/4" diameter brass. Turning between centres enables the two spigoted

NOTE HOLES MARKED a - 4 HOLES φ 1/4 FOR DIAL PILLARS
b - 4 HOLES φ 1/4 SPOTTED AND DRILLED THROUGH FROM AUXILIARY FRONT PLATE
c - HOLES TAPPED 6BA
PRECISE POSITIONS OF UNDIMENSIONED CENTRES TO BE DETERMINED BY DEPTHING

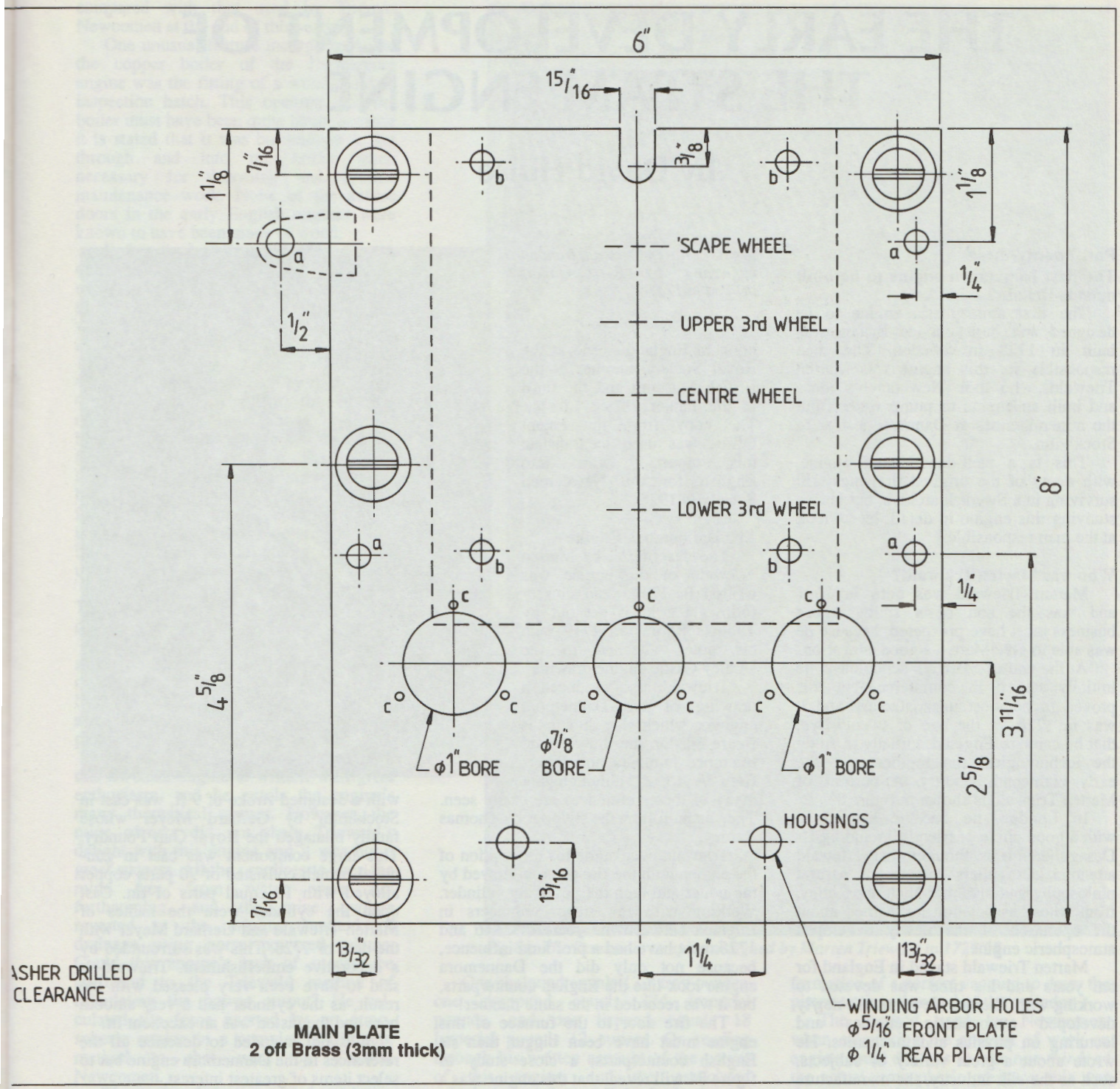


AUXILIARY FRONT PLATE
1 off Brass (3mm thick)

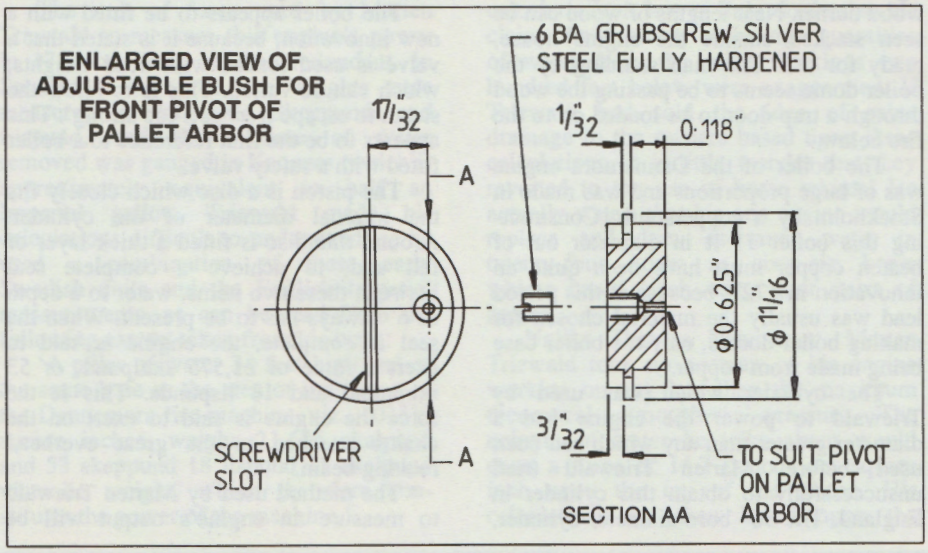




AUXILIARY FRONT PLATE PILLAR
4 off Brass



MAIN PLATE
2 off Brass (3mm thick)



ends of each pillar to be accurately machined in relation to one another and for the stipulated height to be kept within close limits so that the ball bearings of the barrel and second wheel arbors will have about 0.005" end float. Cheese headed 0BA screws, with thick 3/4" diameter washers, screwed into each end of the pillars ensure that the assembly of plates and pillars will be rigid.

The auxiliary front plate is also made from 3mm thick brass and the 1/4" diameter holes for its pillars are drilled, following a similar procedure to that already described using locating pegs to achieve accurate register with the main front plate. It will be advantageous to make two auxiliary front plates at this time, the spare being used later for

Continued on page 94

THE EARLY DEVELOPMENT OF THE STEAM ENGINE

by David Hulse

Part Twenty-three

The first Newcomen engine to be built outside Britain

The first atmospheric engine to be designed and built outside Britain was built in 1728 in Sweden. The man responsible for this engine was Marten Triewald, who took Newcomen's ideas and built an engine to pump water from the mineral mines at Dannemora near to Stockholm.

This is a well-documented engine, with many of the original drawings still surviving in a Swedish archive, but before studying this engine in detail, let us look at the man responsible.

Who was Marten Triewald?

Marten Triewald was born in 1691 and was the son of a smith whose business must have prospered, because he was able to give Marten a good education.

At the end of Marten's schooldays, he initially started in commerce, but this proved to be most unsatisfactory and it was in 1716, at the age of twenty-five, that he came to England, initially to study the technological developments of the early eighteenth century. A portrait of Marten Triewald is shown in figure 83.

In London, he became acquainted with a good circle of friends, including Dr Desaguliers. It is thought that Triewald attended Desaguliers' lectures on natural philosophy and also met Nicholas Ridley, from whose association he learned about the operation of the newly developed atmospheric engine.

Marten Triewald stayed in England for ten years and his time was devoted to working with Thomas Newcomen's newly developed atmospheric engines and lecturing on physics and mechanics. He wrote about a great variety of subjects, such as the silk industry, the manufacture of soap, the cultivation of hops and bee-keeping.

His collection of philosophical instruments is a treasured possession of the University of Lund. It is one of the scientific distinctions of Triewald that he, conjointly with the great botanist Carl Linnaeus, was the founder of the Royal Academy of Science in Stockholm in 1739. He had also the added distinction, of being made a Fellow of the Royal Society of London.

In 1734 he wrote *A Short Description of the Atmospheric Engine*, a compilation of records of the time he spent in England working on the early steam engines, culminating in his own account of the Dannemora engine.

Marten Triewald died in 1747 at the comparatively early age of fifty-six. There are only three known copies of Triewald's book in England – one at the Royal Society, another at the British Museum and the third at the Patent Office Library. The copy from the Patent Office was used to translate this important work into English for the Newcomen Society in 1928.

Fig 83: Marten Triewald from an engraving by E Geringius printed in 1735.

The Dannemora Engine

The description by Marten Triewald of the engine was written in 1734 and closely follows the ideas set out by Thomas Barney in 1719 with his notes attached to the Dudley Castle engine drawing.

Triewald also produced a drawing of the Dannemora engine, which is shown as figure 84. On the drawing are reference numbers and letters from A to Z, although not many of these references are easily seen. They again follow the style set by Thomas Barney.

Triewald even starts his description of the engine with the fire place, followed by the boiler and then the powering cylinder. Working with the steam engineers in England between the years of 1716 and 1726 must have had a profound influence, because not only did the Dannemora engine look like the English counterparts, but it was recorded in the same manner!

The fire door to the furnace of this engine must have been bigger than its English counterparts; a close study of figure 84 will reveal that this engine was a wood burner. Neat lengths of wood can be seen stacked outside the engine house, ready for use. The man standing by the boiler dome seems to be passing the wood through a trap door to be loaded on to the fire below.

The boiler of the Dannemora engine was of large proportions and was made in Stockholm by a coppersmith. Constructing this boiler 11 ft in diameter out of beaten copper must have been quite an innovation in 1727, because at this period lead was usually the material chosen for making boiler domes, only the boiler base being made from copper.

The cylinder which was used by Triewald to power the engine had a diameter greater than any which had been used before. Marten Triewald tried unsuccessfully to obtain this cylinder in England. The 36" bore diameter cylinder, with a designed stroke of 9 ft, was cast in Stockholm by Gerhard Meyer whose family managed the Royal Gun Foundry. This large component was cast in gun-metal, which consisted of 90 parts copper alloyed with 10 equal parts of tin. Cast upon the cylinder were the names of Marten Triewald and Gerhard Meyer with the date of 1728. This was surrounded by a decorative embellishment. Triewald is said to have been very pleased with the result, as the cylinder had a very smooth bore and the piston was an excellent fit.

It is not intended to describe all the references to the Dannemora engine but to select items of greatest interest.

The boiler appears to be fitted with a new innovation, because it is stated that a valve is used loaded with dead weights, which can be varied. This is to allow the steam to escape if it 'gets too strong'. This appears to be the first reference to a boiler fitted with a safety valve.

The piston is a disc which closely fits the internal diameter of the cylinder. Around this disc is fitted a thick layer of felt and, to achieve a complete seal between these two items, water to a depth of 6" always has to be present. When the seal is complete, the engine is said to exert a force of 21,575 skalpund, or 53 skeppund and 18 lispunds. This is the force the engine is said to exert on the chains attached to the great overhead rocking beam.

The method used by Marten Triewald to measure an engine's output will be

compared with that used by Thomas Newcomen at the end of this section.

One unusual feature incorporated into the copper boiler of the Dannemora engine was the fitting of a wooden lid or inspection hatch. This opening into the boiler must have been quite large, because it is stated that it was big enough to get through and into the boiler when necessary for descaling and routine maintenance work. None of the access doors in the early English engines were known to have been made of wood.

Before the building of the Dannemora engine in 1727, never had the great beam of an atmospheric engine to be designed to transmit such a high force. This engine, with the powering force of a cylinder 36" in diameter, would transmit a force of 15,964 pounds (this is a theoretical force with a maximum vacuum) by means of a 4" thick tension chain to the wooden rocking beam positioned above. This great beam measured 30 ft long and was made from six baulks of pine, firmly held together with wrought iron straps and bolts. The composite beam shown in figure 84 is an innovation because the installations before this date are shown to be made from single pieces of wood, usually oak.

The arch heads, or quadrants as Triewald referred to them, were made of oak.

The pump forcing the water to the surface from the mine workings was also of a composite nature, because the pump body was stated to have been made of oak and fitted with an 8" diameter metal plunger.

The description by Marten Triewald of this Swedish engine is written with great enthusiasm, and he extols the engine's many theoretical virtues. However, the mine owners did not share Triewald's delight with this engine and it was not a great success. All the promises to keep the mine free from water were not forthcoming, and the mine owners reverted to the original method of drainage using horse powered whims. Could this engine's lack of success be attributed to the Triewald method of calculating the power output? He calculated the force exerted by an atmospheric engine in a completely different method to that used by Thomas Newcomen.

The unit of force used by Marten Triewald to measure this engine's power in 1727 has long become redundant. In Sweden at this time, the weights were measured in Skalpunds, Skeppunds and Lispund, and the volume of water removed was gauged in Kannors, which is approximately equivalent to half an Imperial gallon. Triewald made his calculations difficult to understand, as he used a combination of these early Swedish units and the English Imperial measurements, as can be read from the following extract taken from his book:

'A pillar of water 34 feet high and of the same base as the area of the piston of the Dannemora fire-machine, viz., $1018^{2}/_{7}$ square inches, weighs 21,575 skalpund and 53 skeppund 18 lispund 15 skalpund victualie weight, which therefore constitutes the power of the machine.'

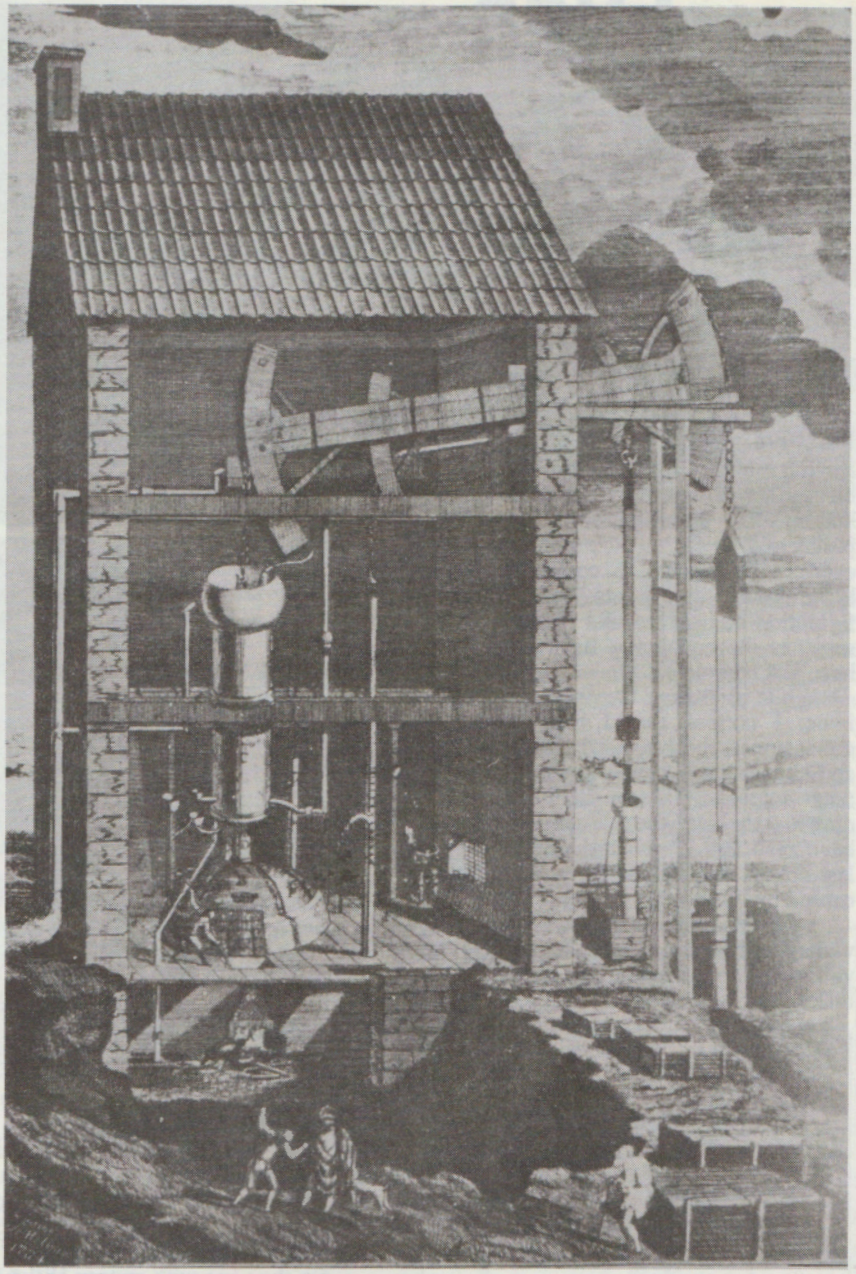


Fig 84: The Dannemore engine designed by Marten Triewald in 1727/28.

One skalpund equals 13.7 troy ounces, one skeppund equals 374 Imperial pounds, and one lispund equals 18 Imperial pounds 12 ounces. On reading through his written account of the power of this engine, and the associated calculations, it leaves little doubt that his claims for drawing such large quantities of water from the mine workings two hundred feet below were exaggerated. If Triewald had sold the idea of mine drainage to the owners based upon these calculations, it is little wonder that they reverted to the use of horse whims! He actually states, that his one engine would replace and draw as much water in twenty-four hours as sixty-six horse whims could, each using four pairs of horses.

Unlike Thomas Newcomen, Marten Triewald took no account of his engine working on any less than the maximum theoretical atmospheric pressure. The column of water he talks about would exert a force of 14.7 pounds per square inch upon the top of the piston. His calculations are then based upon the formation of a perfect vacuum to draw the piston to the other end of the cylinder.

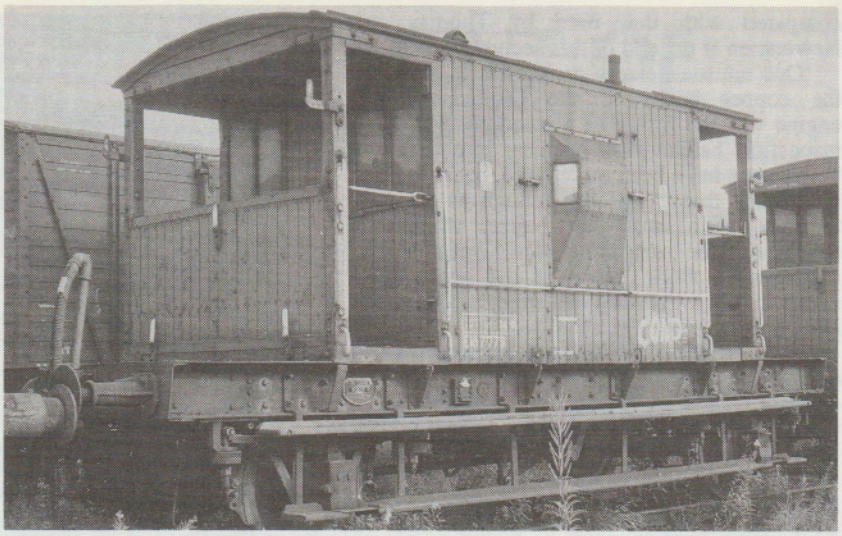
The method used by Newcomen, when calculating the amount of work an engine could do, was to take *two-thirds* of the actual atmospheric pressure; this was the vacuum he could re-create on the underside of the piston. This method of power calculation satisfied all the installations in the British Isles throughout the eighteenth century.

The power output of the Swedish engines is stated as 21,575 skalpunds. This force, when converted into Imperial units, would have been impossible to achieve. Trials were conducted over the following three years to try and perfect this engine, but they only produced a limited success and after this time the owners of the mine reverted to the original drainage method. The engine remained in its original building until c1775, but all that now remains is the engine house shown as figure 84 on its original site but now empty of any fittings.

To be continued.

LNER 20 TON BRAKE VAN

Doug Hewson

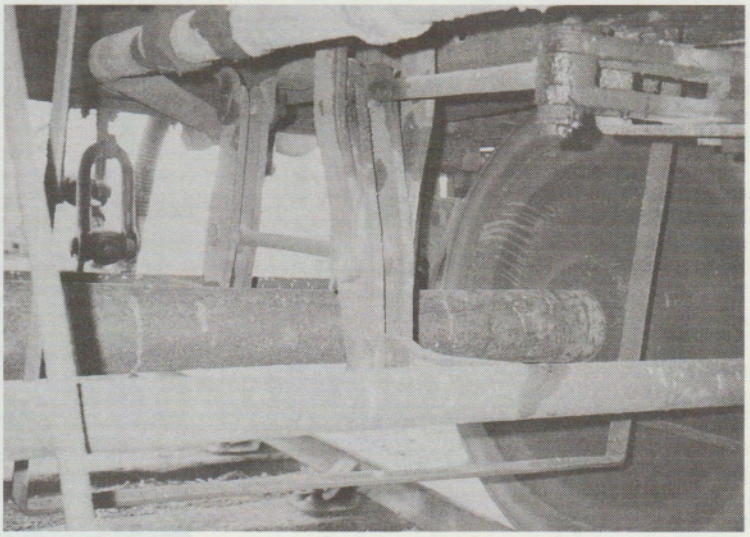


Part Five

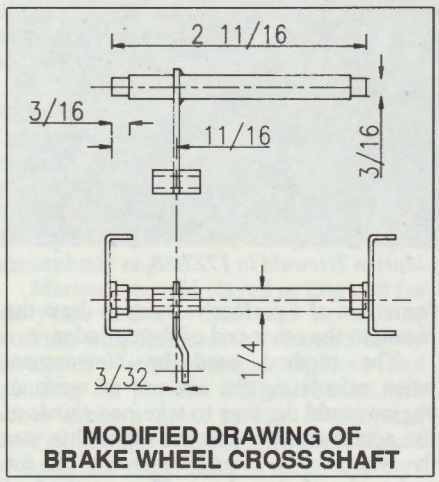
Having said that hopefully we would get a bit further this time, I have been on holiday, so unfortunately I have not progressed as far as I had hoped! However, I did manage to complete all the brake gear components and the configuration of links around the axle is the same as the equalising links which you have just completed.

While producing the drawings for this issue, I noticed that I had incorrectly dimensioned the brake wheel cross shaft and the spacing between the inner and outer solebars. As seen in the corrected drawing below, the dimension should have read $2^{11}/_{16}$" rather than that shown last month. I apologise for any confusion caused by this error.

By now you must have decided which variety of brake van you are building, so you will know whether the van has two brake blocks per wheel or four brake blocks held in carriers per wheel. As far as I can make out without any better evidence, the early vans had pairs of brake trusses, one of which was a plain one and the other truss had a centre link with adjusting holes similar to the LMS plywood van described previously.



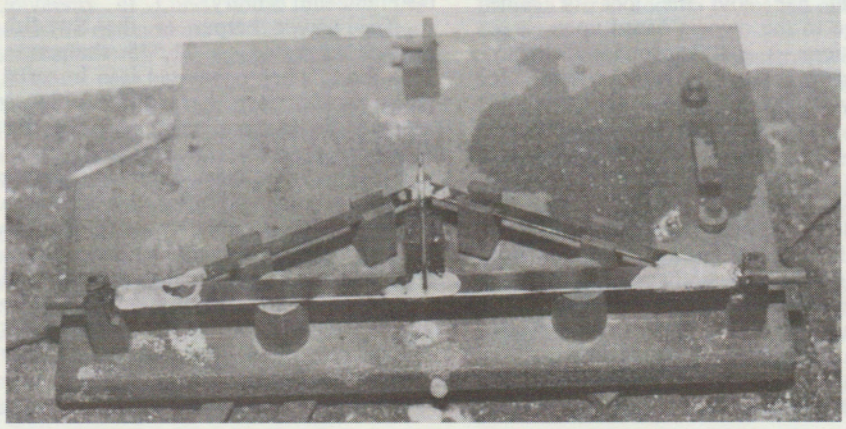
The inside brake truss and pull rod arrangements on a BR brake van. Note also the vacuum pipe changing sides, the safety hoop around the truss link and the hook on which the screw coupling is hung when out of use. The truss rod in the foreground is round bar.

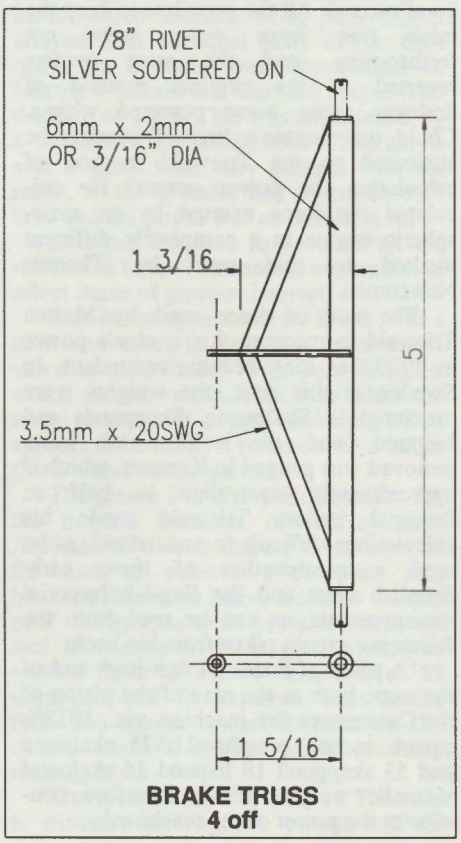


MODIFIED DRAWING OF BRAKE WHEEL CROSS SHAFT

On the vans with sixteen brake blocks the brake trusses are all identical, but either way they can be made in the same jig as described for the LMS plywood van. The trusses are simply made from snipped off lengths of 6mm × 2mm mild steel strip, with 5mm × 20 swg steel strip and 3.5mm × 20 swg steel strip for the diagonal bracing. The pins which carry the brake blocks or the brake block carriers are merely $^1/_8$" steel rivets with the heads turned flat which are then silver

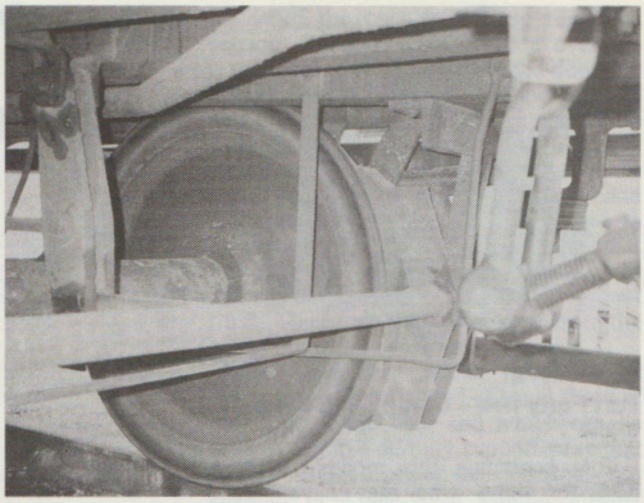
A brake truss in construction. I have alternative cradles to carry the main cross piece so that I can also make them with $^3/_{16}$" rod. The pins projecting from the baseplate on the right hand side is the jig for assembling the 'dog bone' brake hangers.





BRAKE TRUSS
4 off

Brake hanger and block carriers which all have to be fabricated. At the top of the photograph is the vacuum pipe branch which passes up to the guards valve in the van and the sacrificial steel shuttering for the concrete filled underframe to attain the 20 ton tare weight. Note the coil spring on the outside of the brake block carrier.



Another view of the brake block carrier, hung from a small angle riveted across the underframe members. It is glaringly obvious that there are no holes in the wheels.

soldered to the ends of the trusses.

The pull rods for the brake gear are all made from 3/32" mild steel welding rod with collars silver soldered to each end. The collars are turned from 1/4" welding rod and parted off in 3/16" lengths.

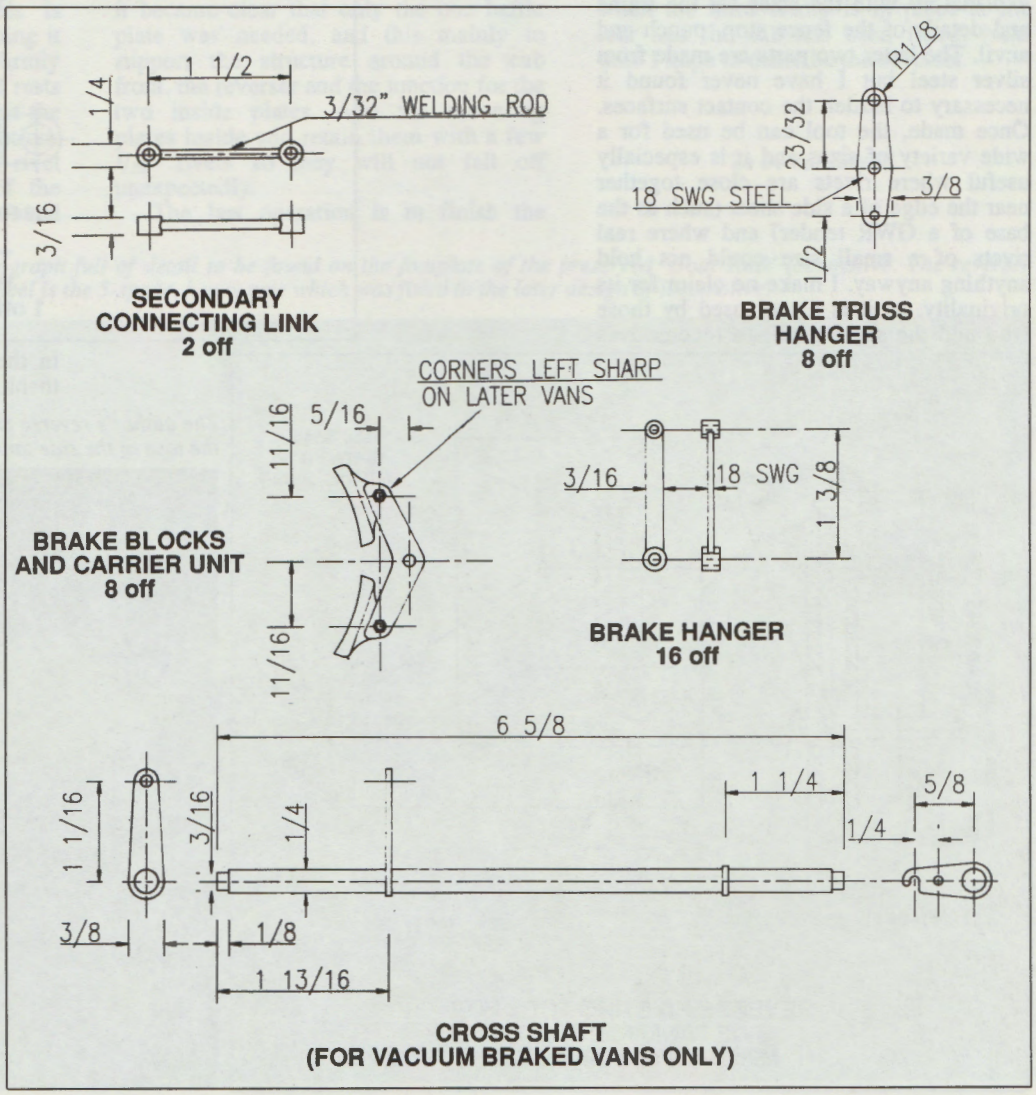
It is quite obvious from the photographs that the main cross piece of the brake trusses on some of the brake vans is made from round bar, which in our case scales nicely to 3/16". Both ends of each truss will require turning down to 1/8" diameter for the brake block carriers and, once assembled, can be cross-drilled for the 3/64" split pin. As can be seen in one of the photographs, there is a spring on the outer end of the truss which ensures that the brake block carrier is held in position and does not trail on the wheel.

On the same baseplate as I have my jig for the trusses, I also have two pins projecting vertically with collars and a small cradle to make life easy when assembling the 'dog bone' brake hangers. Each hanger is made from two turned collars and a strip of 4.5mm x 20 swg sheared mild steel strip silver soldered together in this little jig. Note from the photograph of the full size hanger that the top collar is smaller than the bottom one, so in our size the top pin can be turned from 3/16" rod and the bottom pin from 1/4" rod. To make the top collars of the hangers, I just drill a 3/32" hole as deep as my nerves will allow and then part off each collar at 3/16" long. The bottom collars are drilled No. 30 for the 1/8" ends on the trusses.

If you are making a model of the fully fitted LNER brake van, then the vacuum cylinder can be made and fitted as described in the LMS plywood van article. However, I will try to get one of my vacuum fitted vans working properly before we complete construction of this vehicle, so that at least I can describe how to finish off the vacuum fitted brake gear properly! We now have a source of some very fine 'O' rings which are used for sealing the backs of Swiss watches and make perfect rolling rings for the working scale vacuum cylinders. These came to me courtesy of Philip Bellamy who has carried out some sterling work in experimenting with proper rolling ring vacuum cylinders. The example he brought to the Harrogate exhibition worked merely by sucking on the end of the vacuum pipe attached to the cylinder and certainly would have had sufficient power at that small vacuum to apply the brakes.

Now that I have completed the BR Mark I coach, I can spend a little more time on this aspect of brake gear as I already have about ten vehicles which require vacuum cylinders to be completed.

To be continued.



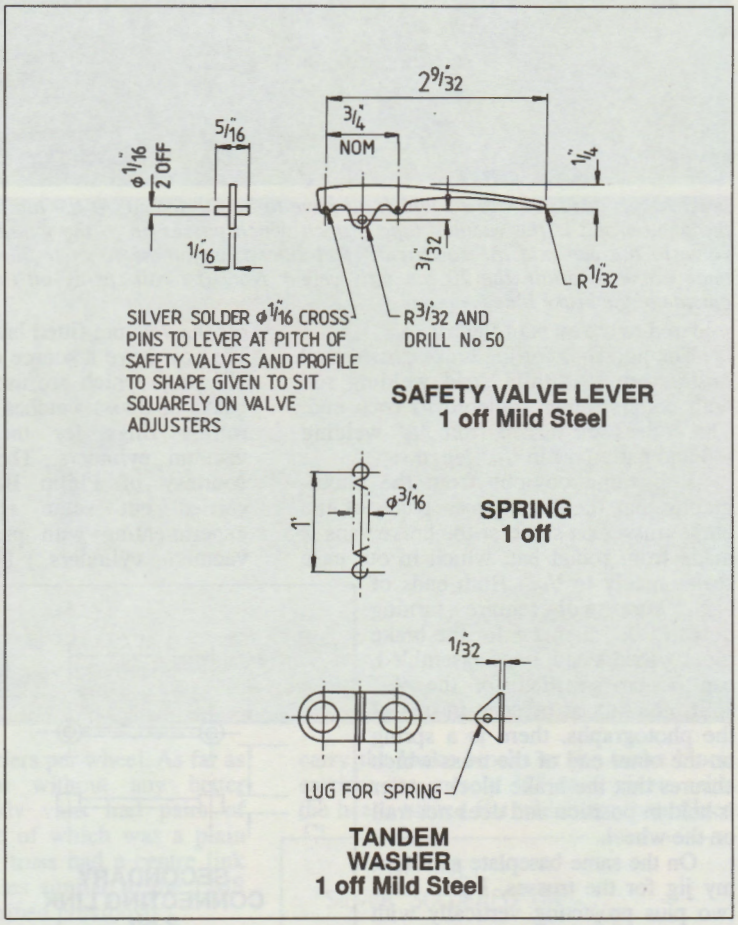
LNWR 0-6-2T 'Coal Tank' Locomotive in 5" gauge

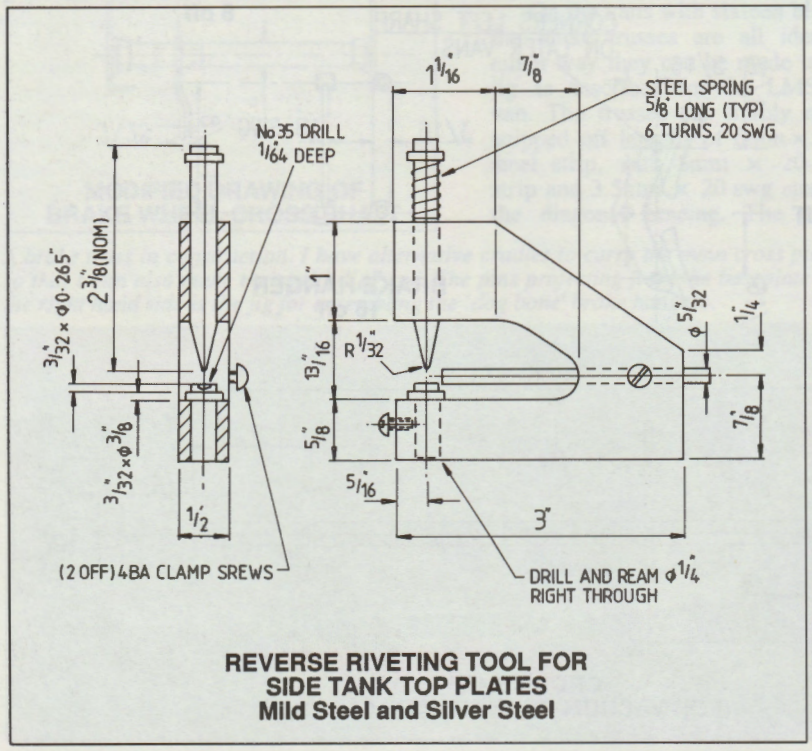
described by Hotspur

Part Forty five – Completing the side tanks

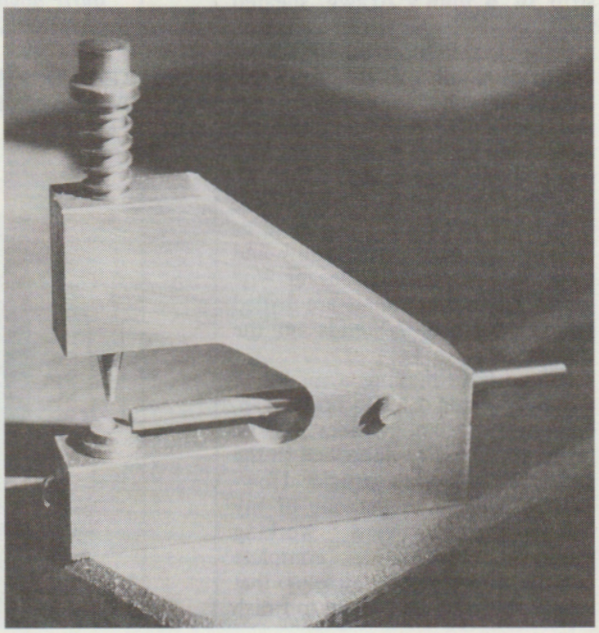
Before beginning this month's description, for those who may have been wondering what happened to the drawing for the dummy Ramsbottom safety valve lever, I have included the missing drawing this month. Note that at the 3/4" pitch dimension, there are two pins which protrude equally each side of the lever to locate on top of the valve spring adjusters. Also shown is the spring and the special tandem washer with its lug which sits under the valves.

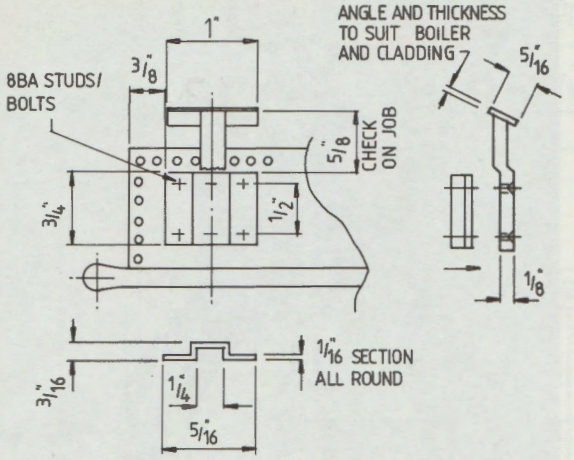
Those who have been following these notes will remember that last time I proposed to describe the reverse 'riveting' tool for adding the realism to the tank tops. My drawing for the tool is included here and it should be self explanatory with the sizes for the frame and details of the fence stop, punch and anvil. The latter two parts are made from silver steel but I have never found it necessary to harden the contact surfaces. Once made, the tool can be used for a wide variety of sizes and it is especially useful where rivets are close together near the edge of a side sheet (such as the base of a GWR tender) and where real rivets of a small size could not hold anything anyway. I make no claim for its originality, as it is a tool used by those who add the same detail to locomotives in the much smaller scales, but I must thank them for the technique.





The author's reverse riveting punch used to add the detail to the tops of the side tanks.





DUMMY SIDE TANK SUPPORT CLAMP
Mild Steel (Left Hand drawn)

To use the tool I strongly recommend a practice run to become conversant with the method and to get to know the feel of the hammer on the punch. Hold the side of a scrap of 20 swg brass sheet against the stop and hit the punch. If the 'rivet' head shape is not fully formed, replace the plate and do it again. I find it better to give the punch three or four blows and the sound of the hammer on the punch will change when the detail is correct and the tip of the punch will tend to stick slightly in the indentation – this is normal. Move the plate along, keeping it against the stop, and hold it down firmly so the outside diameter of the anvil rests against the first 'rivet' head, then hit the punch again. Repeating these operations will give a line of equi-spaced rivet indents as straight as the side of the material. Over a distance it will be found that the material will become slightly curved but it is easily straightened.

Begin the top plate at the front outside corner under the handrail. Turn the plate over and put the first 'rivet' in 1/8" from each edge. Continue and put the extra six in across the plate to the inside edge and, if the pitch is correct, they will be centralised. Next, work down the outside edge of the plate to where the gap should be left. However, before starting, decide how many proper rivets are to be used to hold the plate to the outer angle; one every thirteen or fourteen indentations should be enough. At these points I made a small punch mark and used this as a drilling centre for a 1/16" rivet which I then inserted temporarily as a spacer for the next punching operation. The same process was followed for the inside row of 'rivets' and the edges tinned to take the angles and mounting plates as shown. With the gaps for the reverser and the fixing angle for the cab, it was convenient to begin the 'rivets' from the other end, so as to achieve the correct spacing.

Put the brass angle on the top plate by 'tacking' it with soft solder and drill through to insert the holding rivets. The top plate can now be fixed to the outer side sheet and fully soldered to the two end plate angles and the baffle plate(s). By the time I had progressed to this point it became clear that only the one baffle plate was needed, and this mainly to support the structure around the cab front, the reverser and the junction for the two inside plates. Add the mounting plates inside and retain them with a few 1/32" rivets so they will not fall off unexpectedly.

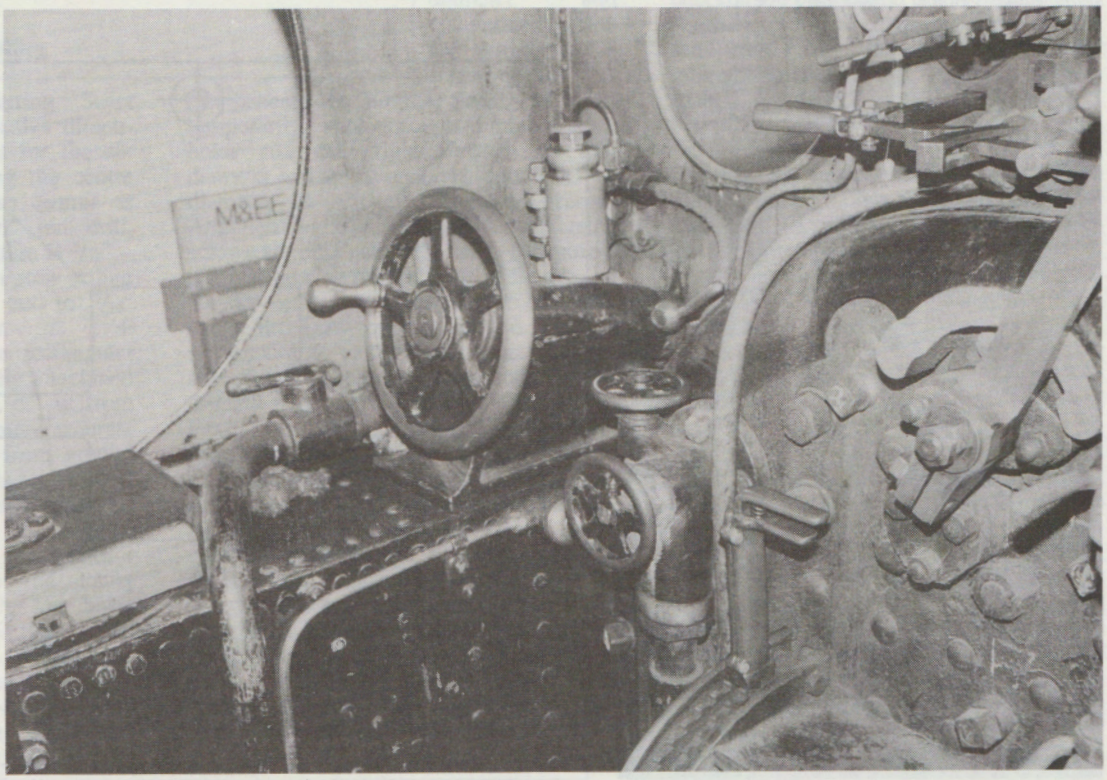
The last operation is to finish the inside of the tank by adding the front section and then the last plate over the rear wheel arch. This cannot be done yet though, because there are some parts to add to the top plate by fitting screws up from underneath to act as studs. There is the dummy access plate and tank support bracket at the front, and for the left hand plate, the reverser. A glance forward to the photograph of the reverser shows that there are some rivets on the platework in the cab which are countersunk but not flush. These can be added too before the plates are finally soldered into place.

The last item which needs to be mentioned is the flanged channel fitted at the front of the tank and which can be used to clamp a dummy support strap that is also retained under the cleading. The channel is a piece of simple milling finished to size and fastened to the tank top as shown with four more 8BA studs up from inside, through the same mounting plate as that holding the round cover plate. The strap itself is made from 1/4" wide steel bar machined to form a step over the rivets on the inner edge of the tank, and then silver soldered to a narrow piece of 3/32" steel strip set at an angle of about 60 degrees to match the curvature of the boiler. Two countersunk screws from inside the channel keep it held in place.

As described, the side tank is surprisingly rigid, but what shake there is as the reverser is turned will disappear when the third clamp is in place at the rear and the cab has been fitted. Next time I hope to describe the reverser.

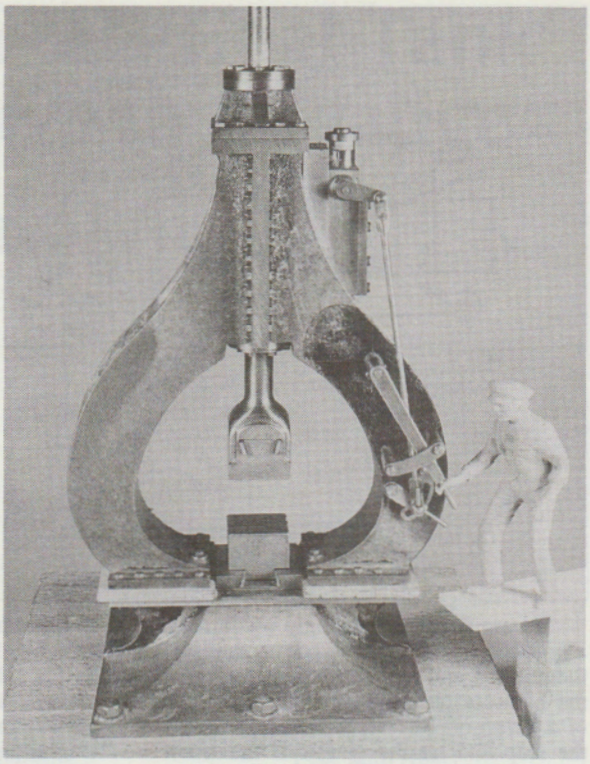
To be continued.

A photograph full of detail to be found on the footplate of the preserved 'Coal Tank' locomotive. The reverser handwheel is the 5-spoke, heavy type which was fitted to the later design of locomotive.



Robert Morrison's 1865
THREE TON DOUBLE ACTING STEAM HAMMER
in 1/2" scale

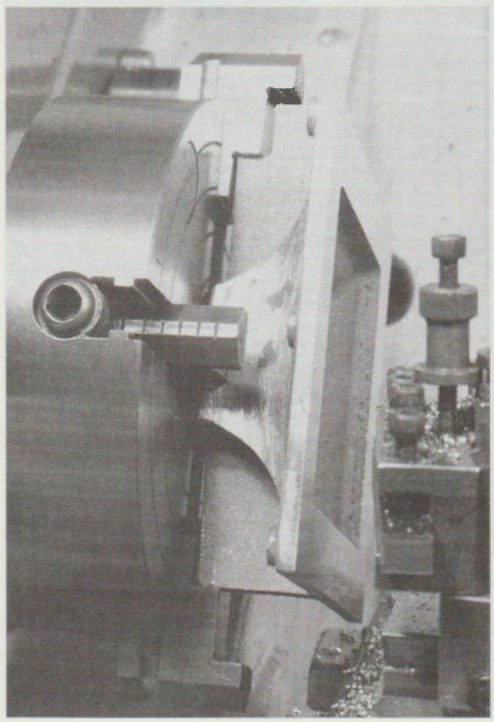
David Piddington



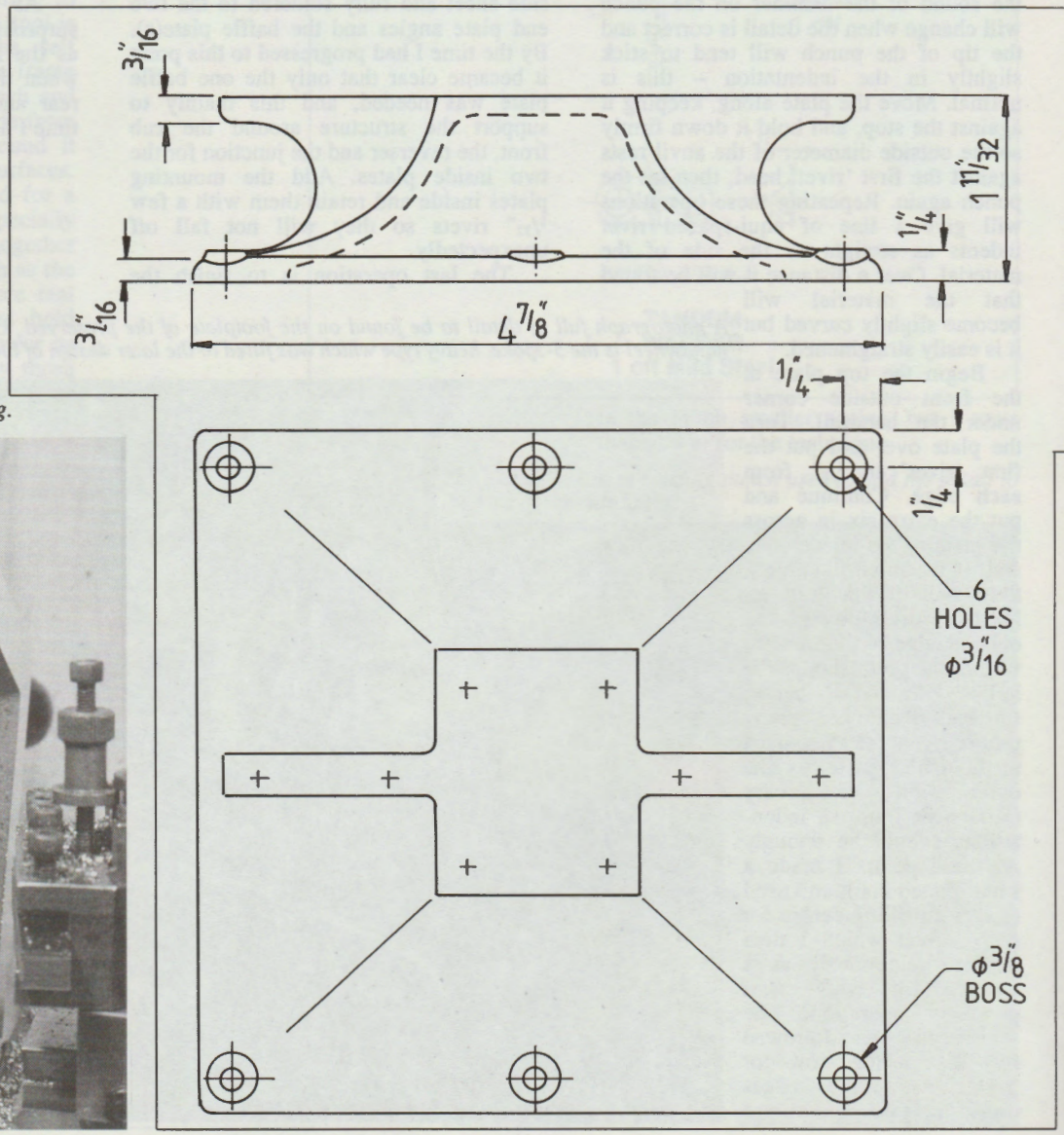
Part Two

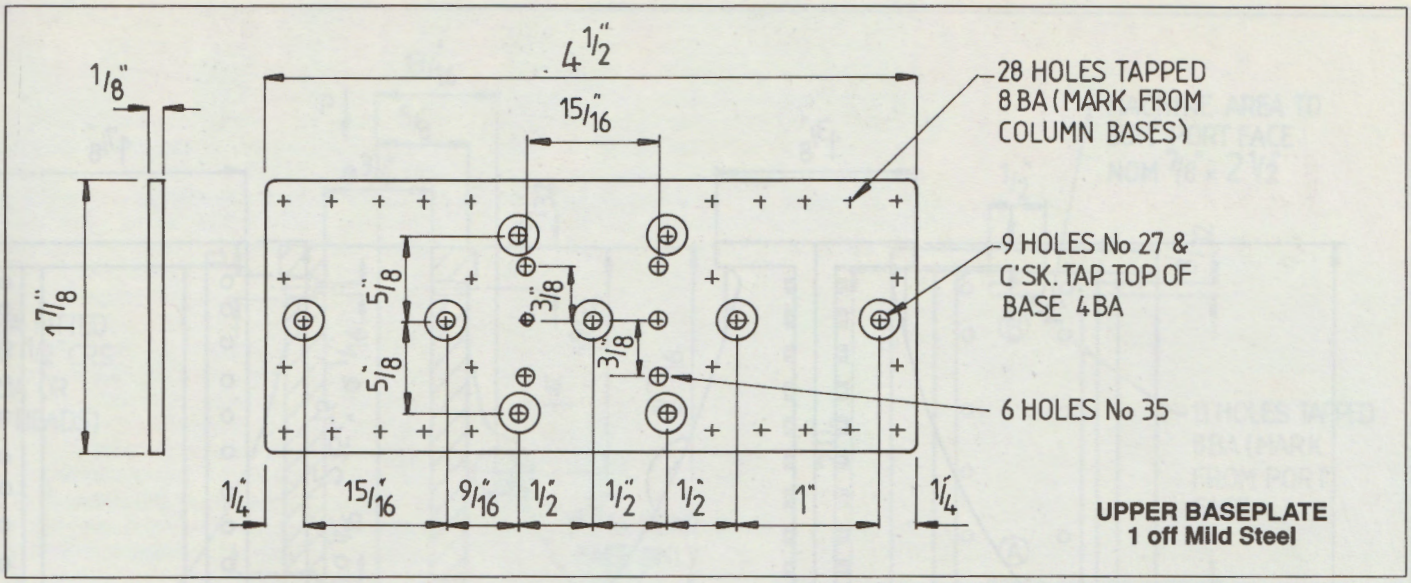
The baseplate should be carefully fettled all over, ie. cleaned up with files on all surfaces, firstly by removing the sprues where the metal has been fed into and out of the relevant parts of the mould. On my sample castings, these were on the bottom and on opposite edges. Clean all over the bottom face and then place down on a surface plate and check whether the casting rocks across a diagonal. If it does, then grip the casting in a large vice across the said diagonal and give the upper corner a sharp knock with a hammer, then try again on the surface plate. Once you have achieved a result with less than 0.010" rock, we can consider machining the top and bottom surfaces. The cleaning of unmachined surfaces may take quite some time, but it is worth doing thoroughly and a minimum of filling will then be needed prior to painting. Painting will be necessary as the original machine's components were in iron, while those of our model are in gunmetal and so will need disguising as to their true colour. I believe that a semi-matt black would be appropriate for the whole model.

Across the casting are two support beams and the side of these may be gripped in opposing jaws of your 4-jaw chuck. The other jaws are brought up close to give side support, though not gripped tightly as they would mark the curved flanks. On the prototype these side beams were cast integral with the part I have titled 'upper baseplate', but I considered that this part made separately in steel would absolve me from making a difficult pattern and two even more



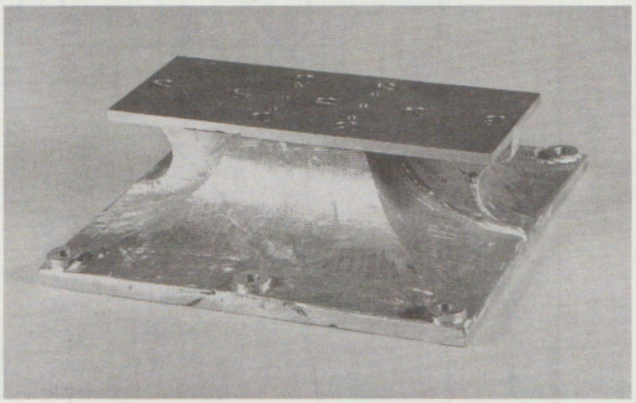
Facing the bottom of the base casting.



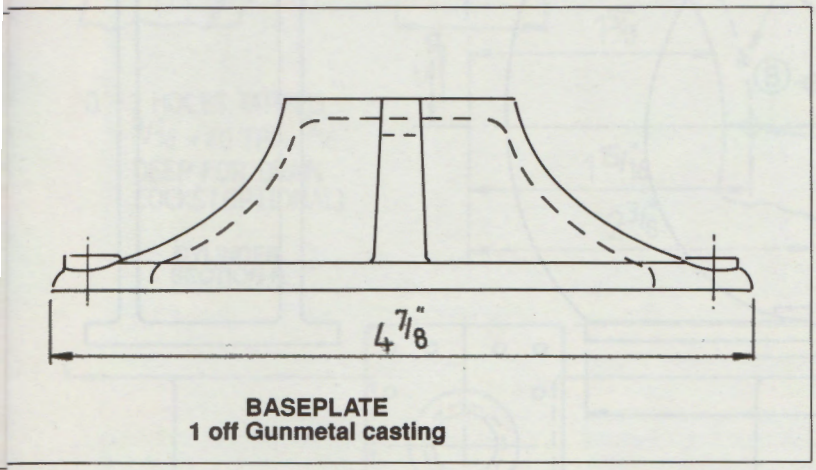


difficult coreboxes. Subsequent fettling would also have been more difficult.

Reverse the casting into the outside grips of all four jaws of the chuck and machine away the top to a dimension of $1^{11}/_{32}$". The easy way to measure this is to set a tool tip by rule from the chuck jaw prior to inserting the casting and setting your topslide to zero. Insert the casting and face away using the topslide dial until the zero coincides with the setting. Strict accuracy is not necessary on this dimension. We can now mark out for the six bolting down holes, adjusting the centre dot to coincide with the boss centres as required. If you have a $1/2$" pin drill, initially drill for its pilot – mine is $5/32$" – face the boss tops to a depth stop setting and then open the holes out to $3/16$" diameter for the securing bolts.



The base with upper base fixed temporarily. The casting surfaces have been lightly fettled.



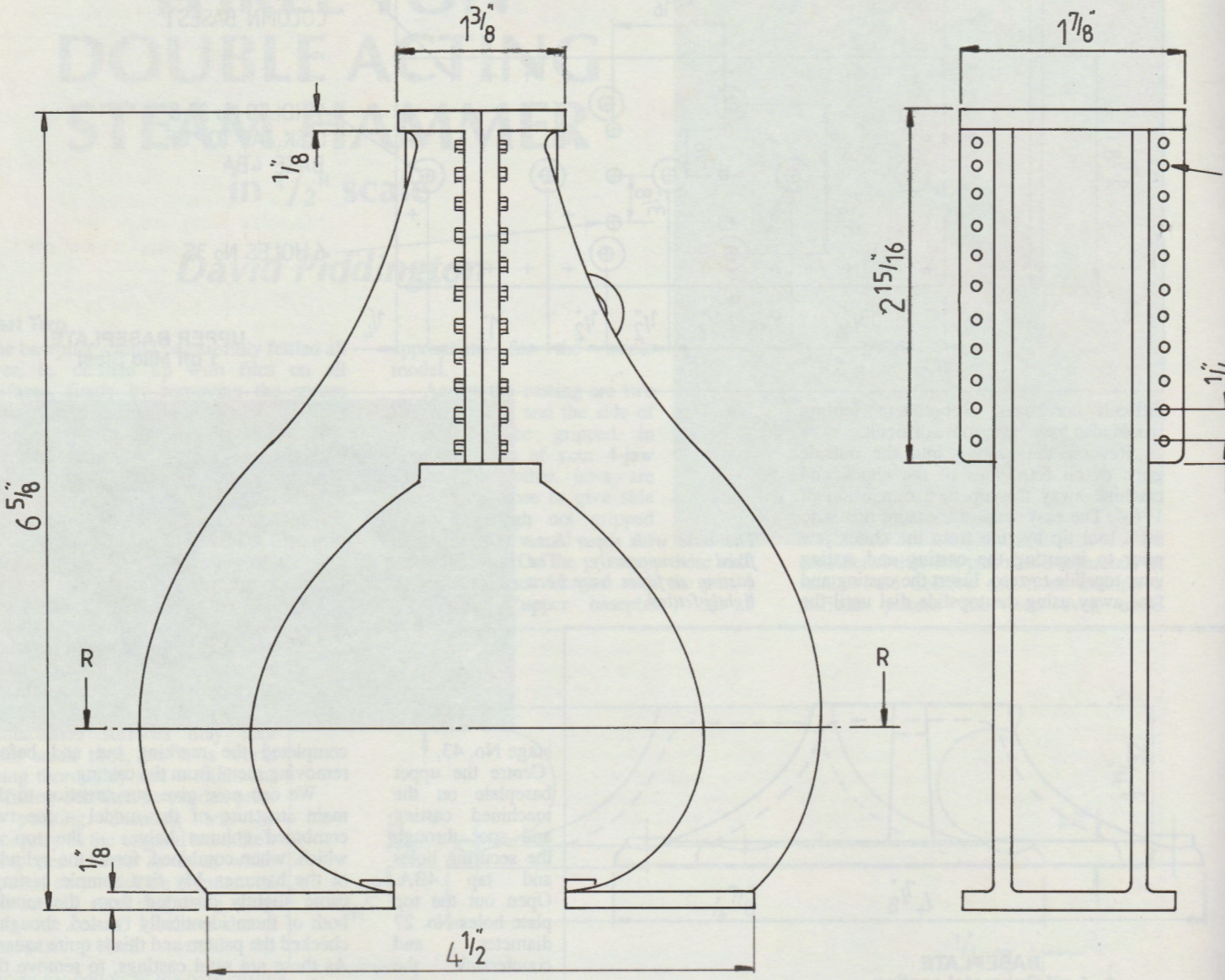
The upper baseplate is a rectangular piece of steel plate accurately machined from drawn bar, if available, or cut from larger sheared plate, or for a more accurate alternative it may be made from ground gauge plate. The finished size is $1^7/_8$" × $4^1/_2$", and (other than the gauge plate) should be as flat as possible, hence the recommendation to use gauge plate. Mark out for the nine holes to secure the lower baseplate, making sure that the four holes to tap into the support beams will in fact tap into the beam centres. Adjust any reluctant holes sideways from the axis if necessary and drill them No. 31. Also mark out for the six securing screws for the lower anvil, drilling them at this stage No. 43.

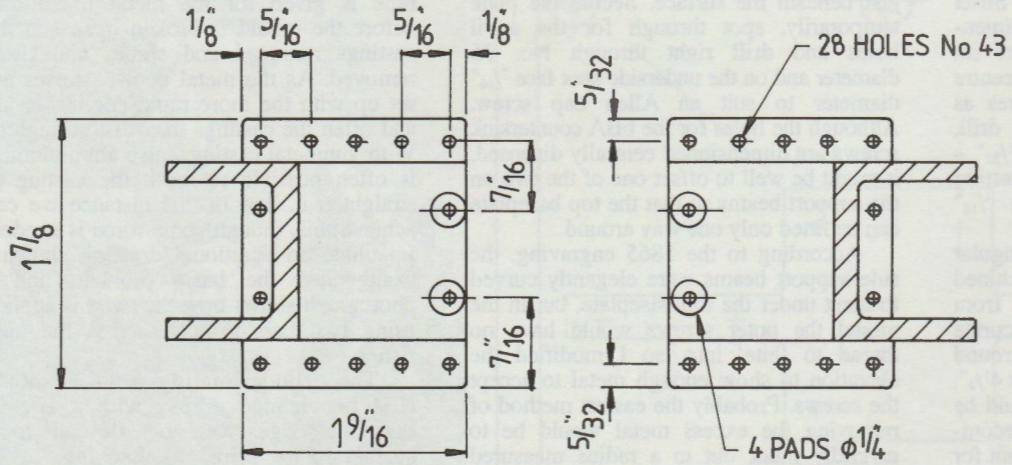
Centre the upper baseplate on the machined casting and spot through the securing holes and tap 4BA. Open out the top plate holes No. 27 diameter and countersink the **top** surface until a screw head lies just beneath the surface. Secure the plate temporarily, spot through for the anvil holes and drill right through No. 35 diameter and on the underside spot face $3/16$" diameter to suit an Allen cap screw. Although the holes for the 6BA countersink screws are dimensioned centrally disposed, it might be well to offset one of the two on the support beams so that the top baseplate can be fitted only one way around.

According to the 1865 engraving, the side support beams were elegantly curved to meet under the top baseplate, but in the model the outer screws would have no thread to 'bite' into, so I modified the elevation to show enough metal to accept the screws. Probably the easiest method of removing the excess metal would be to carefully mark out to a radius measured directly from the assembly – mine was $15/16$" – scribing a semi-circle with dividers and drill inside the arc formed a series of $7/64$" holes close together – a process called chain drilling – and then cut out the waste with an Abrafile blade, following up with half round files and emery cloth. Remove the upper baseplate once you have completed the marking out and before removing metal from the casting.

We can now give our attention to the main structure of the model – the two combined column halves – the top of which, when combined, forms the cylinder of the hammer. My first sample castings came slightly distorted from the mould, both of them identically twisted, though I checked the pattern and this is quite square. As these are sand castings, to remove the sand more easily after the metal has been poured into the mould, only a minimum time is given for the metal to solidify before the mould is broken open and the castings removed and sprues and risers removed. As the metal cools, stresses are set up with the more rapid cooling in air, and often the castings may distort slightly. With gunmetal castings, also aluminium, it is often possible to work the casting to straighten it, and in this instance we can achieve this, though some force is needed. I include an additional drawing showing exaggerated the basic problem and a photograph shows how the twist is applied using two bars gripped across the base flange.

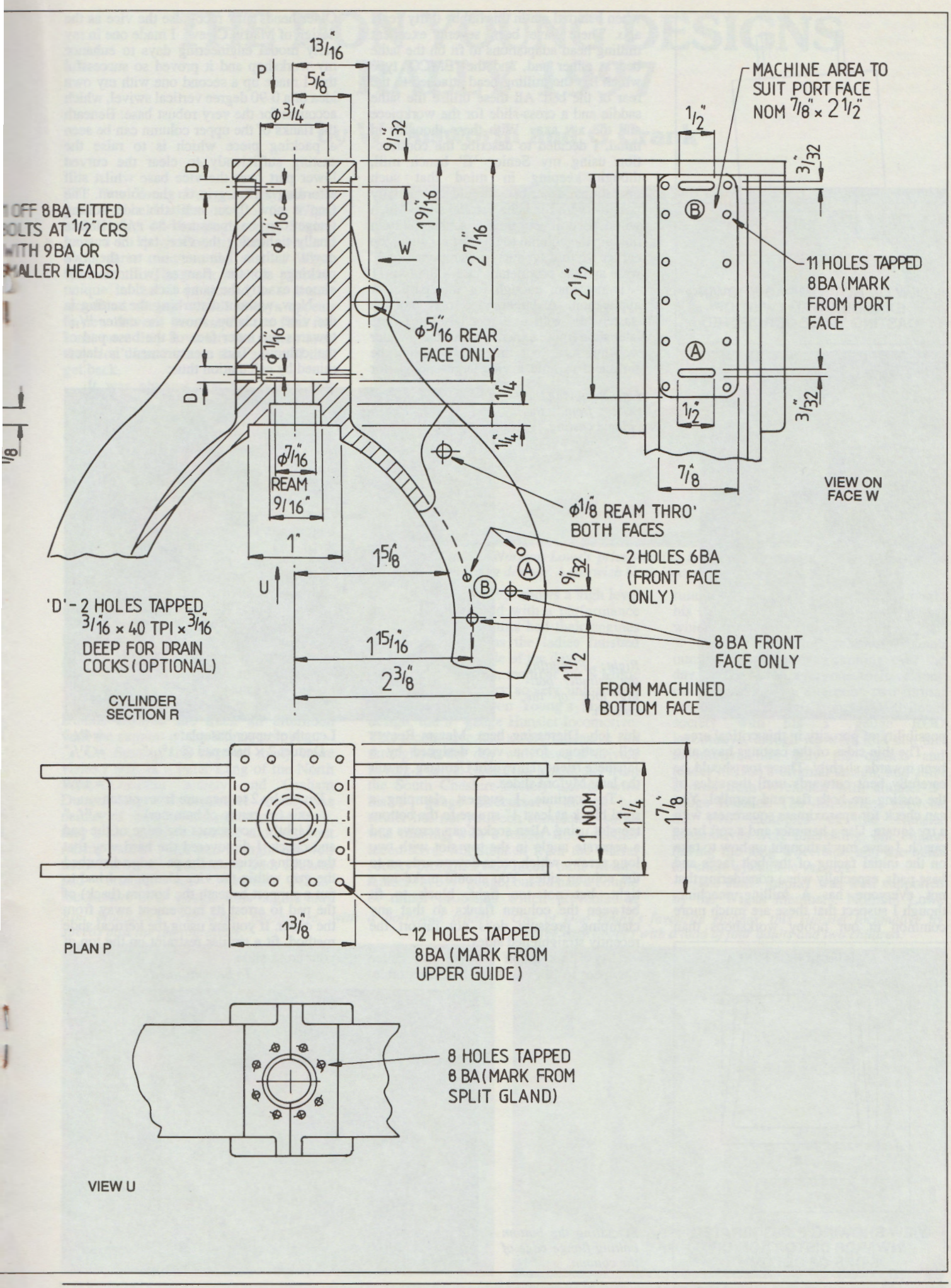
The cylinder mating surfaces should first be cleaned across with a file so that the edges can be aligned to a surface plate prior to checking, as in the diagram. Another point where my first samples differ from yours is that the mating faces had both sunk on cooling, so an additional thickness of metal has been added to the face centre area to compensate. I thought that this, though making the castings slightly more expensive, would reduce the

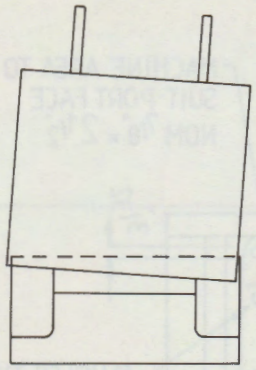




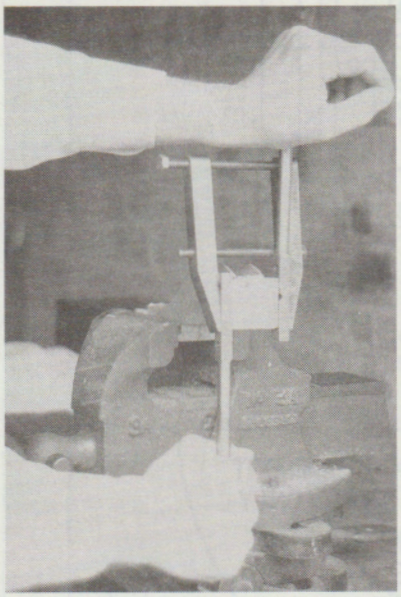
SECTION RR

COLUMN
2 off Gunmetal castings


13/16"
P
5/8"
φ3/4"
9/32"
D
φ1/16"
19/16"
W
2 7/16"
φ5/16 REAR FACE ONLY
φ1/16"
1 1/4"
φ7/16" REAM 9/16"
1"
1 5/8"
φ1/8 REAM THRO' BOTH FACES
2 HOLES 6BA (FRONT FACE ONLY)
9/32"
8 BA FRONT FACE ONLY
1 15/16"
2 3/8"
1 1/2"
FROM MACHINED BOTTOM FACE
'D' - 2 HOLES TAPPED 3/16" x 40 TPI x 3/16" DEEP FOR DRAIN COCKS (OPTIONAL)
CYLINDER SECTION R
MACHINE AREA TO SUIT PORT FACE NOM 7/8" x 2 1/2"
1 1/2"
3/32"
11 HOLES TAPPED 8BA (MARK FROM PORT FACE
2 1/2"
1 1/2"
3/32"
7/8"
VIEW ON FACE W
1" NOM
1 1/4"
1 7/8"
1 3/8"
12 HOLES TAPPED 8BA (MARK FROM UPPER GUIDE)
PLAN P
8 HOLES TAPPED 8 BA (MARK FROM SPLIT GLAND)
VIEW U

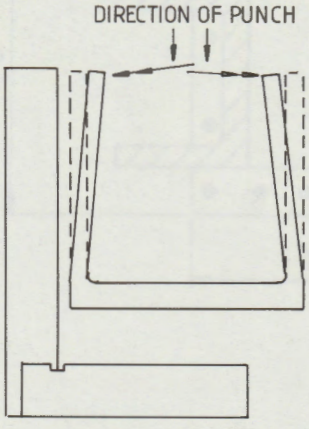


VIEW ON BOTTOM PAD SHOWING EXAGGERATED TWIST OF CASTING TO BE CORRECTED



possibility of porosity in this critical area.

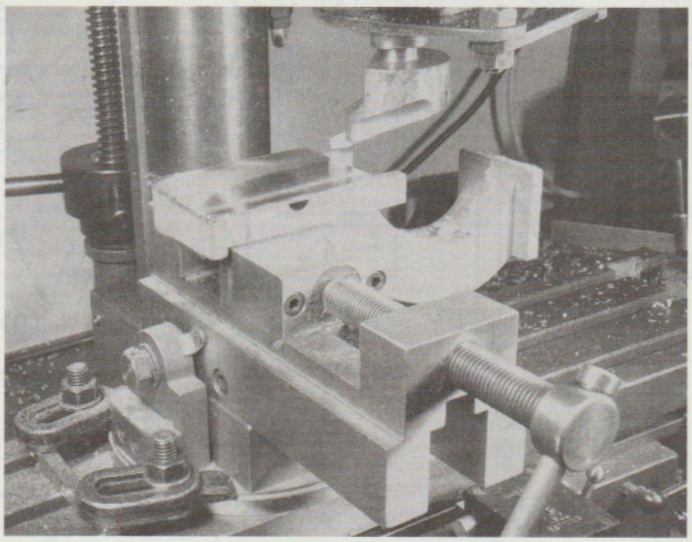
The thin sides of the castings have also bent inwards slightly. These too should be carefully bent outwards until the sides of the casting are both flat and parallel. You can check for approximate squareness with a try square. Use a hammer and a soft brass punch. I gave much thought on how to take on the initial facing of the bolt faces and base pads, especially when considering that not everyone has a milling machine, though I suspect that these are much more common in our hobby workshops than



VIEW SHOWING EXAGGERATED INWARDS DISTORTION OF SIDES OF COLUMN

when I started out in this hobby thirty years ago. There have been several excellent milling head adaptations to fit on the lathe bed at either end, and the 'EMCO' type which has the milling head attached to the rear of the bed. All these utilise the lathe saddle and a cross-slide for the workpiece and the x-y axes. With these thoughts in mind, I decided to describe the construction using my Senior 'E' bench mill, though keeping in mind that such operations described should be equally possible with the lathe vertical slide. Much will depend in your improvisation ability in holding the column to the vertical slide; the earlier Myford type has a clamp face of 3" wide and the proprietary vice – the No. 71 – is not man enough for this particular application. A larger vice may not be 'fastenable' with its larger base area. The later slide (more expensive too) has a wider working face, but this may still not be sufficient to hold a vice large enough for this job. Digressing here, Messrs Reeves sell castings for a vice designed by a Japanese friend, Hiroyoshi Uematsu, to suit the later Myford slides.

Left: Removing the twist from the column casting.



Right: Flycutting the cylinder bolting face of the column.

To continue, I suggest clamping a steel block at least 1" square to the bottom tee-slot using Allen socket cap screws and a separate angle in the top slot with two long screws which press downwards on to the column sides. You should make up a tight, but not too tight, block to fit between the column flanks so that any clamping pressure does not distort the recently straightened sides.

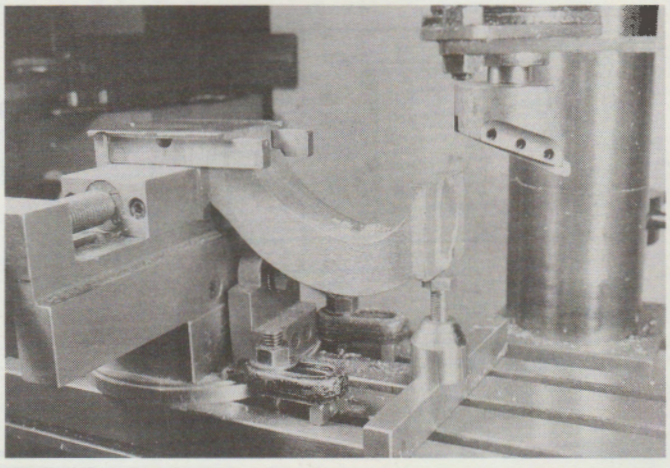
My photograph shows my vice clamped to the milling machine table. Older hands may recognise the vice as the design of Martin Cleeve. I made one in my early model engineering days to enhance my workshop and it proved so successful that I made up a second one with my own idea of a 0-90 degree vertical swivel, which accounts for the very robust base. Beneath the flanks of the upper column can be seen a packing piece which is to raise the casting sufficiently to clear the curved lower part over the vice base whilst still affording a firm grip on the column. The face is now flycut until the side bolting flange can be measured to $^{1}/_{8}$". Before finally tightening the vice, tap the casting down with a hammer on to the two packings so the flanges will machine almost exactly the same each side.

Now, without disturbing the setting in the vice or clamp, move the cutter $^{11}/_{16}$" towards the inner face of the base pad of the column. This measurement is determined by calculation thus:

Length of upper baseplate = $4^{1}/_{2}$"
Deduct 2 × base pad @ $1^{9}/_{16}$" = $3^{1}/_{8}$"
= $1^{3}/_{8}$"
Divide by 2 to measure from piston axis (ie. centre of hammer) = $^{11}/_{16}$"

Lightly face across the edge of the pad and check. I discovered the hard way that the cutting action on the pad edge disturbed the grip within the vice clamp, so I had to put a support beneath the bottom (back) of the pad to arrest its movement away from the cutter. If you are using the vertical slide method, fit a similar restraint on the top of your cross-slide.

To be continued.



Flycutting the bottom bolting flange edge of the column.

THE DON YOUNG DESIGNS RALLY 1997

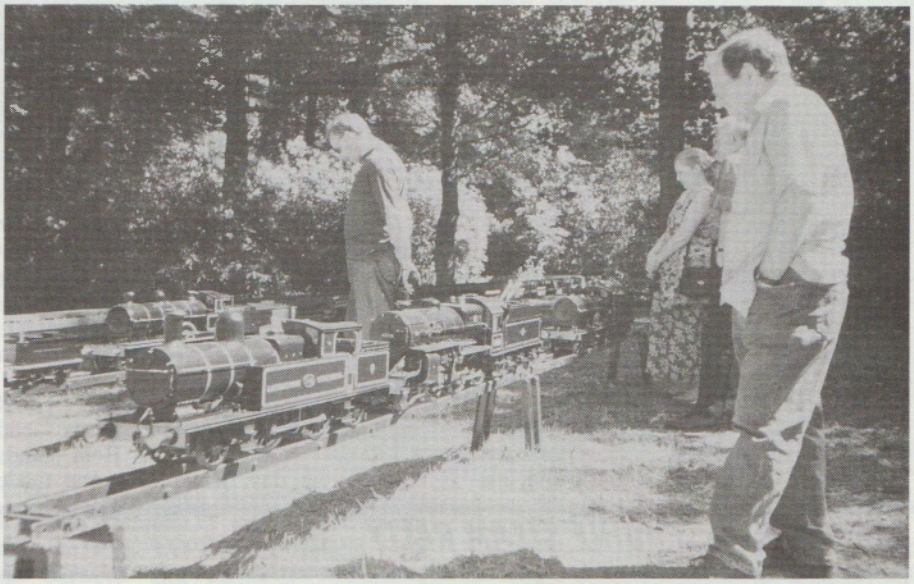
by W Unsworth and G Crank

The Don Young Designs Rally for this year was held at the track of the Wigan and District Model Engineering Society located in Haigh Country Park, which is about three miles to the east of Wigan town centre. The track itself is probably unique in that it is located in a mature woodland setting, which always appeals to new drivers, because for the first few runs, once they have left the station area, they don't know where they are until they get back.

It was obvious that the Wigan club members had put in a lot of preparation work because the track and surrounding area was spick and span with all the rhododendrons in full flower. Extensive alterations carried out over the previous winter included a new truck shed, plus a very ingenious 'bendy rail' to select one of four tracks out of the shed, which feeds a turntable, giving access to rearranged and increased steaming bays. The track itself is 1,760 ft in length, equipped with an anti-tip rail, and has two gradients of approximately 1 in 100, with a minimum radius curve of 50 ft.

The very first visitors were Dennis Mortimer and his wife with their 3½" gauge Hunslet locomotive from the Romney Marsh society in Kent. The couple arrived on the Saturday because they had to leave early on Sunday, so Dennis enjoyed the track all afternoon with the support of the Wigan members.

On Sunday the first of many more visitors arrived – Peter Lang of the North West Leicester society and Graham Dutton from the Brighouse society. As neither of them are strangers to the track, they both quickly unloaded and set about raising steam. Peter had brought his well used Derby 4F locomotive and Graham had brought his Horwich 'Crab' locomotive in 5" gauge. This engine may be a few years old, but shows a high level of workmanship and with a performance to match. Both visitors had their engines on the track just as the ladies finished boiling the first kettle of the day.



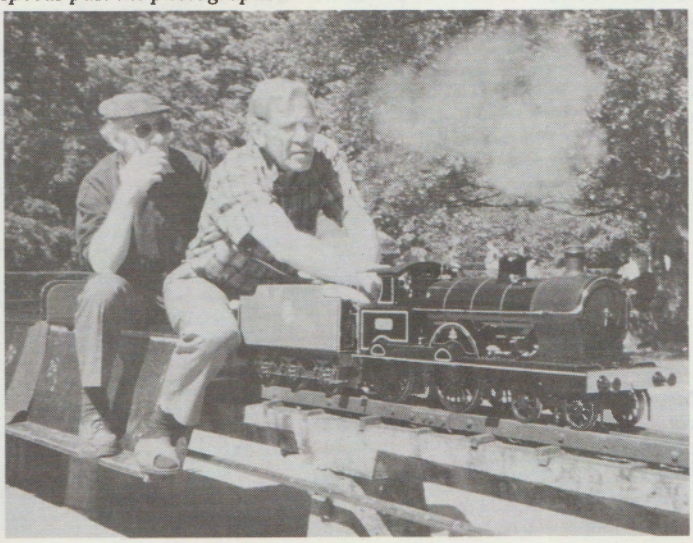
An admirer studies Norman Lowe's prize-winning L&Y radial tank locomotive in the static display of Don Young designs. A Horwich Crab locomotive stands behind the tank engine.

In the meantime, member Mr S Milne from the Shrewsbury society unloaded a fine example of Don Young's favourite design, the 5" gauge Hunslet locomotive. This locomotive had a very extensive run throughout the day with several drivers having a drive. Soon Ron Maddocks from the South Cheshire society arrived with his 5" gauge 'Precursor', though his tender has not yet been completed, so he was running with a tender from another locomotive. Mr Stephen from the Wirral society brought a very nicely built 'Mountaineer' in 3½" gauge, but he had a couple of minor problems which prevented it running on the track. Peter Cottrel brought his 5" gauge L&Y 0-6-0 locomotive, which steamed exceptionally well.

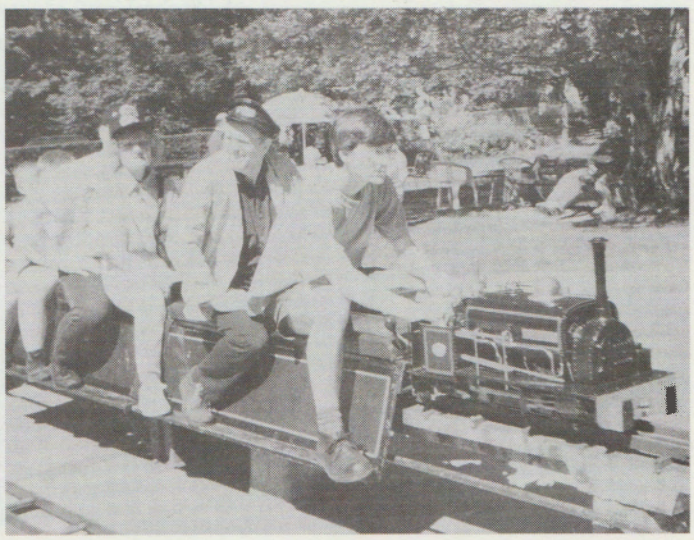
Because of the relatively small number of locomotives running over the day, this allowed everyone to have long runs, though in the afternoon two further visitors – John Davis from the Welshpool society with his 5" gauge ROD locomotive, though we were told that this locomotive had only the chassis and tender to Don's original design, and John Downs from Wrexham with another 5" gauge Hunslet. The differences between the two examples of the Hunslet locomotives were interesting, one engine having the long wheelbase and the other the short wheelbase version.

The static display was well supported by the Wigan members. Norman Lowe

Ron Maddock's 'Precursor' locomotive, with a borrowed tender, speeds past the photographer.

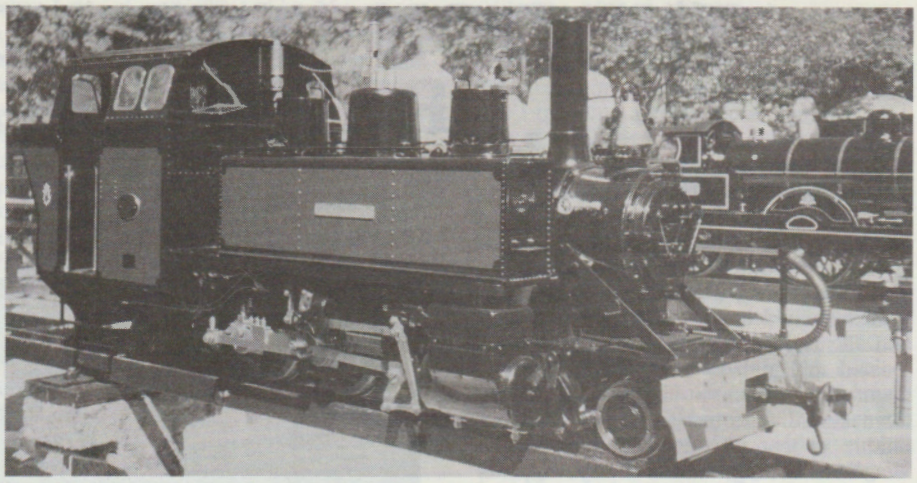


One of Don Young's favourite engines, this Hunslet locomotive by S Milne easily copes with a load of four adults and two children.



had three locomotives on show – his prize-winning L&Y radial tank locomotive to Don's 'Lanky' design, his Horwich 'Crab' and his Precursor 'Alchemist'. Alan Atherton displayed his Precursor 'Beucephalus', though it was not quite complete. Walther Unsworth had his BR Standard Class 2 locomotive on display, probably being one of the first to be built to Don's design. Derek Rigby had his 3½" gauge GWR Saint on show, while Bob Sumner exhibited his LB&SCR Class 13, based on the Derby Class 2P, though it is as yet a long way from completion. One of the younger members of the society, Lee Worthington, showed an incomplete 'Marie E', with the tender finished, and this engine should produce an interesting runner.

Visitor Ken Young of Mold MES showed his 5" gauge Black 5 locomotive under construction for the past 12½ years, though it has run twice so far. This engine has won third prize at both the Harrogate and Midlands model engineering exhibitions. Another incomplete engine, but showing much promise, was the tender for the A3 class engine 'Ladis' brought from Newport by Ken Bradley. The chassis has been run on air and this engine will be very popular when it is completed. The 2P design seems to be popular because another yet incomplete example was shown by Ian Swancott from Shrewsbury.

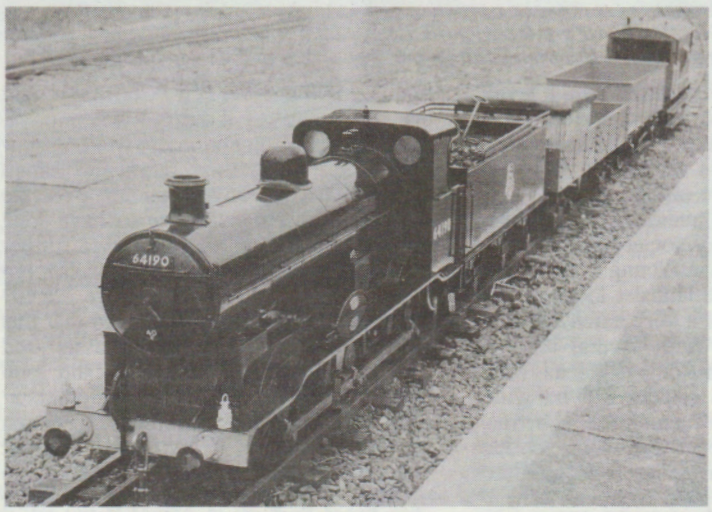


This 3½" gauge Mountaineer built by Mr F Stephen of the Wirral MES attracted much attention even though minor problems kept it from the track.

Trade exhibits included HRM Supplies of Colchester, Essex and A J Reeves of Birmingham. Both stands enjoyed the day, while everyone made special reference to the ladies who did a magnificent job of supplying refreshments all day.

We can be sure that if Don could have been present, he would have enjoyed himself and gained tremendous satisfaction from seeing so many of his designs on show and in action in such a magnificent setting.

THE 13th WHISSENDINE STEAM RALLY – *Continued from page 85*



Ron Heugh's 5" gauge LNER J6 locomotive with a rake of goods wagons. This locomotive won the Stapleford Cup.

Tansley of the Melton club for his excellent 4½" scale Foden winch tractor. It sports an auxiliary steam winch on the rear, three speed gears, twin high pressure cylinders working at 100 psi, and has long range water tanks.

Finally, for the best model in the show, the Bill Palmer Trophy went to Dave Edwards of Lincolnshire for his mighty 4" scale Fowler BB1 ploughing engine.

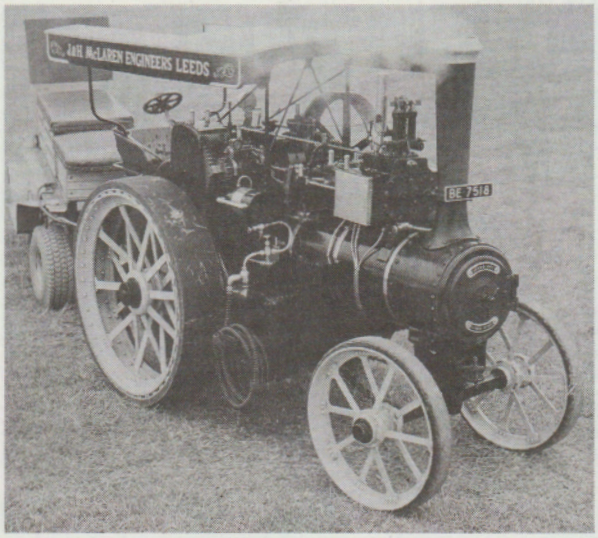
Anyone who has been to a steam rally in Britain will know Eric (Paddy) Hughes of Northern Ireland. This year he left his steam car at home and brought his Atkinson steam wagon in 4½" scale. Built in only eight months, this vehicle has Hackworth valve gear. Eric says it has three gears, but he only uses one – fast!

A very nice 7¼" gauge 'Romulus', owned by George Finnemore, was active on the track. It was built in 1989, but it looked as if it had just been driven out of the paint shop!

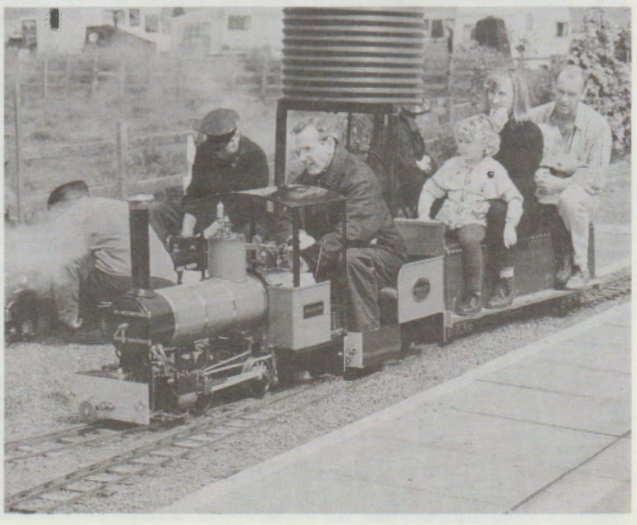
A 3" scale McLaren traction engine 'Captain Scott' by John Evans was constructed from his own drawings and castings. Measurements were taken from the full size engine.

Although the show catalogue numbered just over ninety models, late entries brought this figure to over 120 models. Such support from fellow engineers from all over the British Isles makes all the effort of staging the rally well worthwhile.

Can we hope to see you in 1998?



Left: The 3" scale McLaren traction engine built by James Evans of Derbyshire.



Right: 'Romulus' in ¼" gauge in the station with a happy group of passengers.

THE 13th WHISSENDINE STEAM RALLY

A report by Alf Davies

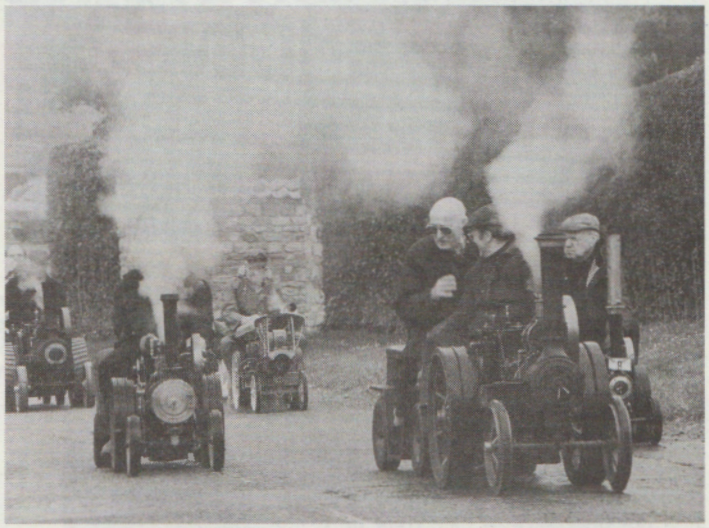
In the first few days of January, whilst most model engineers were getting over Christmas and the New Year and wondering if the cold 'snap' was going to last much longer, Roy Bickley, show secretary and vice chairman of Melton Mowbray & District Model Engineering Society was already turning his thoughts to the (hopefully) balmy days of June as he sat in front of his computer organising the invitations which were to be sent to all previous exhibitors and trade stall holders of the Whissendine Steam Gathering. Any members who may be superstitious could be forgiven for having crossed their fingers as this was to be the thirteenth annual show, held from the 13th to the 15th June!

The 'balmy' days of June soon came, but the weather forecast for the weekend left a lot to be desired. This didn't seem to put off the caravanners who turned up in force during late Friday afternoon and Saturday morning, and we had a full house again with a total of 61 caravans installed by the Saturday.

The road run in conjunction with the local school fete was timed for 11.00am, and the weather looked very threatening. Halfway down to the village, there was a sudden downpour and the children, whose theme this year was the emergency telephone code '999', looked a bedraggled bunch of 'burglars, criminals and policemen'.

The drivers of the traction engines leading the procession had various means of trying to keep dry, including one passenger holding a golfing umbrella over herself and the driver. A total of thirty two engines took part in the road run and eventually all vehicles arrived back at the rally field safely despite the weather.

Although the infamous 'Whissendine wind' was at work all Saturday, as usual we had a constant stream of engines running around the show ground until the barbecue.



Climbing up the hill back to the field in the pouring rain, the safety valves were blowing off on virtually every engine.

Sunday morning dawned even colder than the Saturday. I would have sworn that the wind was coming straight from the Russian steppes! The wind was accompanied by a damp drizzle right from the early hours, despite the fact that the weather forecasters had promised better weather. Actually, the weather *did* clear up later in the morning and warmed up quite a lot as well, so by 2.00pm the ice cream van, which had stood by so forlornly, was doing a roaring trade.

The same could be said of the railway track which had been so sadly neglected by the public. It now had queues forming for train rides and over the two days, we had eleven locomotives on the tracks.

The drive around the parade ring to give the judges a last look for the possible winners of the trophies saw forty five models in steam.

As usual, our president, Lady Gretton, presented the cups and other trophies to the various winners. It seems to me that the judges' task gets more difficult each year, such is the high quality of the exhibits.

The Melton Challenge Cup was presented to Dave Oliver for his 3" Yorkshire steam wagon. This was the first rally for this vehicle. Rob Selby received the Bill Newcombe Cup for a delightful petrol driven Atkinson wagon, while a 6" Sentinel steam tractor by Mark Johnson of Derbyshire was awarded the Falcon Trophy.

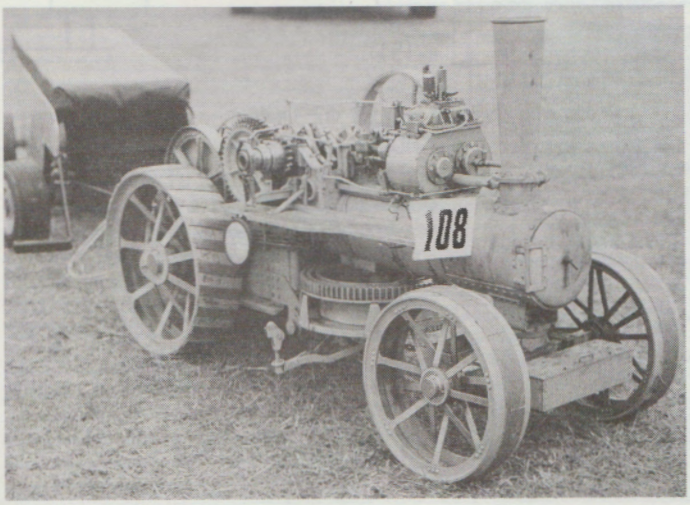
Another well deserved winner was Ron Heugh's 5" gauge LNER J6 0-6-0 locomotive, which received the Stapleford Cup. Ron is a member of the Peterborough club and years ago, he used to be allowed occasionally on to the footplate of the prototype engine driven by his father.

The Stokes Trophy for a non-steam locomotive was awarded to Alf Stobbs of Kettering, while the trophy for general engineering, the Rutland Shield, was won by Ken Circuit for his scale model of a field gun.

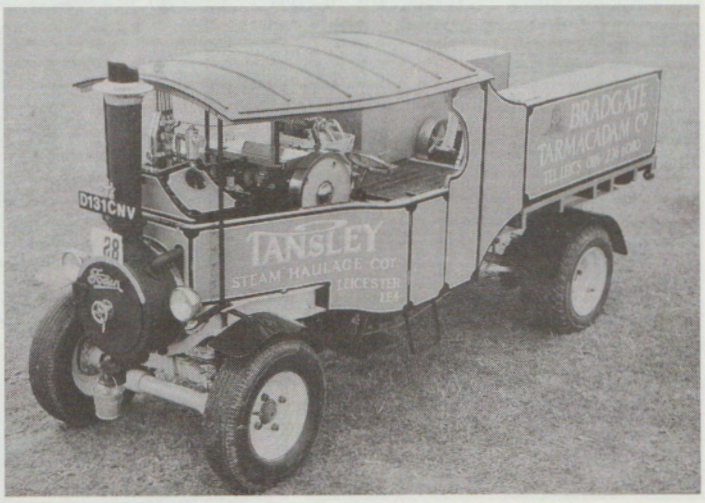
Barry Johnson scooped the Lord Gretton Memorial Bowl for workmanship on his Robey portable engine, while the President's Shield deservedly went to Phil

Continued on page 84

Paul Edwards' Fowler BB1 ploughing engine needed only its coat of paint to be complete.

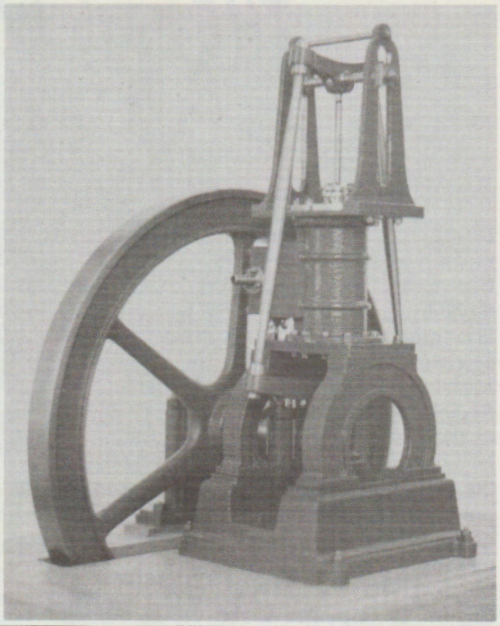


Phil Tansley's magnificent 4½" scale Foden steam winch tractor which won the President's Shield.



REULEAUX'S TRAPEZIUM CONNECTING ROD ENGINE

Model designed and described by Anthony Mount



Part Three

The cylinder is formed from yet another gunmetal casting, but this one is a rather odd shape as it has a rectangular top to take the guide frames. The cylinder is quite a difficult item to hold. The cored hole of 5/8" (16mm) diameter in my casting was quite true, so I made up a mandrel and bolted the casting to it. Setting this up in the lathe, both ends were then faced to bring the cylinder to length. It is not necessary to face right up to the mandrel as any material left can be removed with the boring operation. Do take care however to machine equal amounts from both ends to maintain the correct flange thickness. The cylinder can now be clamped to the faceplate by the rectangular top with a spacer between this and the faceplate to allow the boring bar to pass through. I made my spacer from 1/2" (12mm) birch plywood which is a fairly hard material and, being wood, that gives extra friction between the cylinder and faceplate.

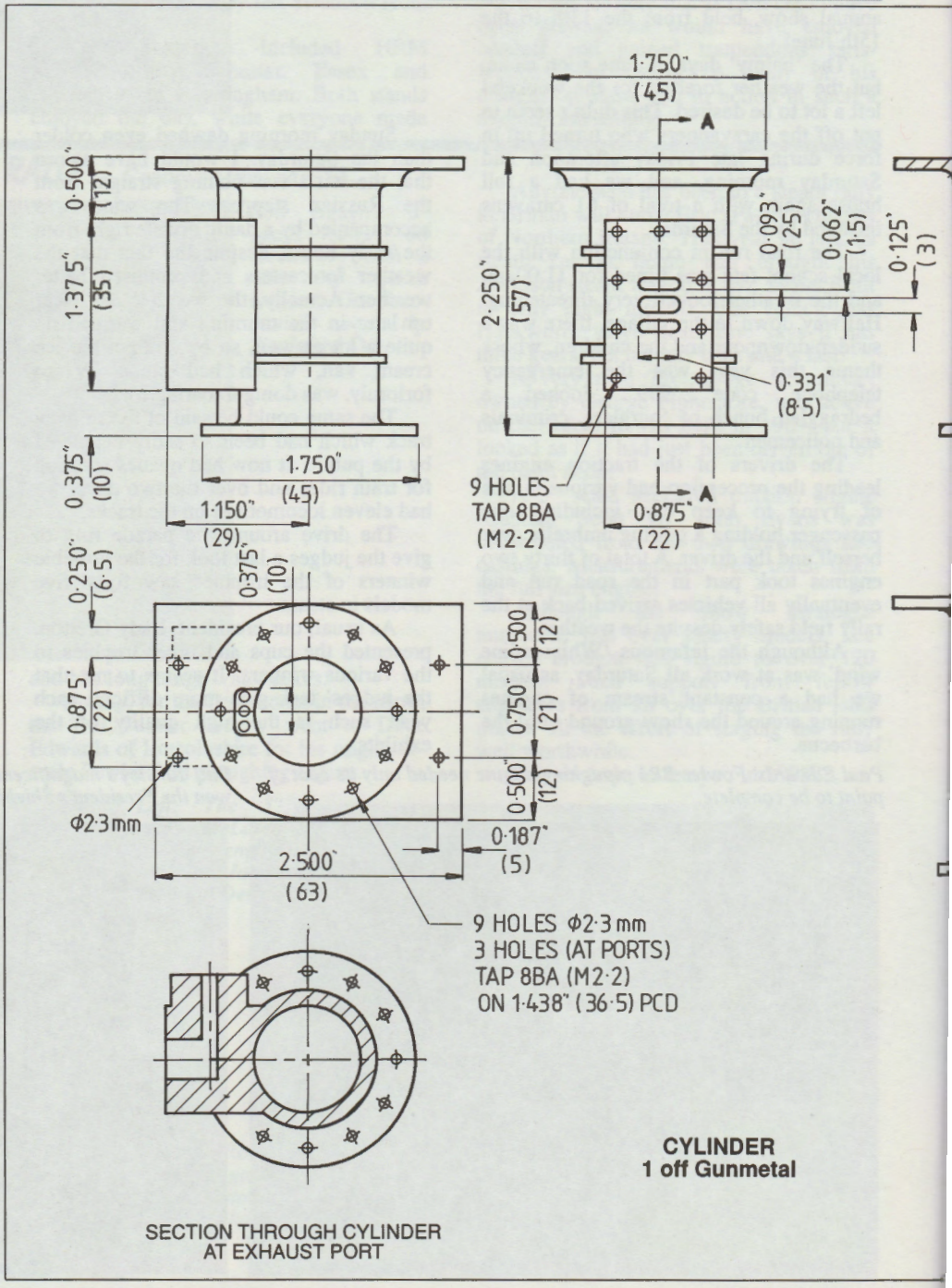
Remove any material left on the top face when machining on the mandrel. and then bore out to 7/8" (22mm) diameter. Run the boring bar through a couple of times at the same setting on automatic feed to give a nice parallel finish to the bore. Use as stiff a boring bar as possible, I started with a 1/2" (12mm) bar and finished with one of 5/8" (16)mm) diameter. The cylinder bore can be further improved with honing or lapping.

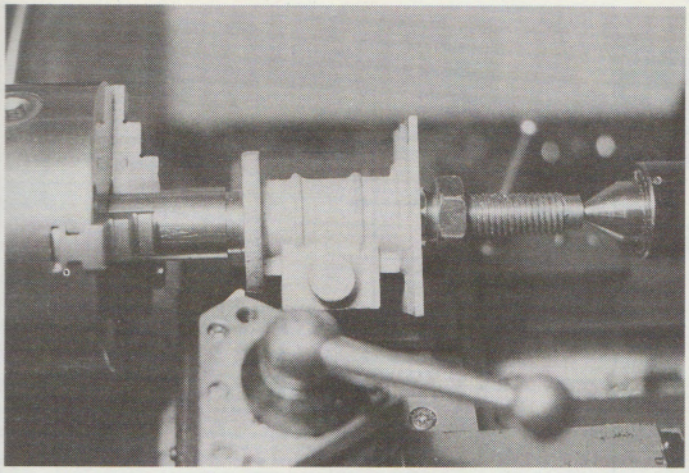
My photograph shows the cylinder reversed and mounted on another mandrel – a stub one this time – for counterboring the cylinder. This feature is not shown on the drawings, but it is always a good idea to counterbore a cylinder for if any reboring needs to be carried out this can be done without needing to make new covers.

Over now to the milling machine and, with a bolt passing down the bore, clamp the cylinder to the table and, with the steamchest face set parallel to the table axis, mill the top flange to size. The cylinder can now be bolted to an angle-plate to allow access to the valve face which can now be milled flat, and the steam ports machined in using slot drills. Turn the cylinder through 90 degrees as shown in my second photograph and face the exhaust flange. Using the cylinder cover as a template, drill the stud holes.

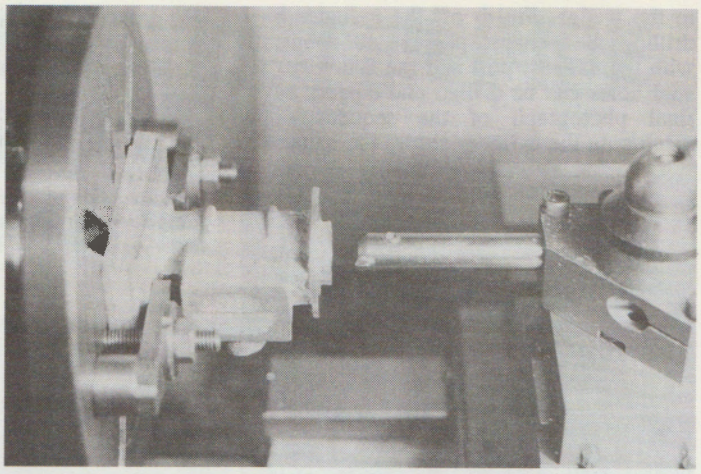
As the table and the cylinder have rectangular shapes of the same width, the two can be held against an angle-plate when drilling the stud holes thus ensuring correct orientation of the holes. Then mark out and drill the holes for the guide frames.

The cylinder can then be clamped in



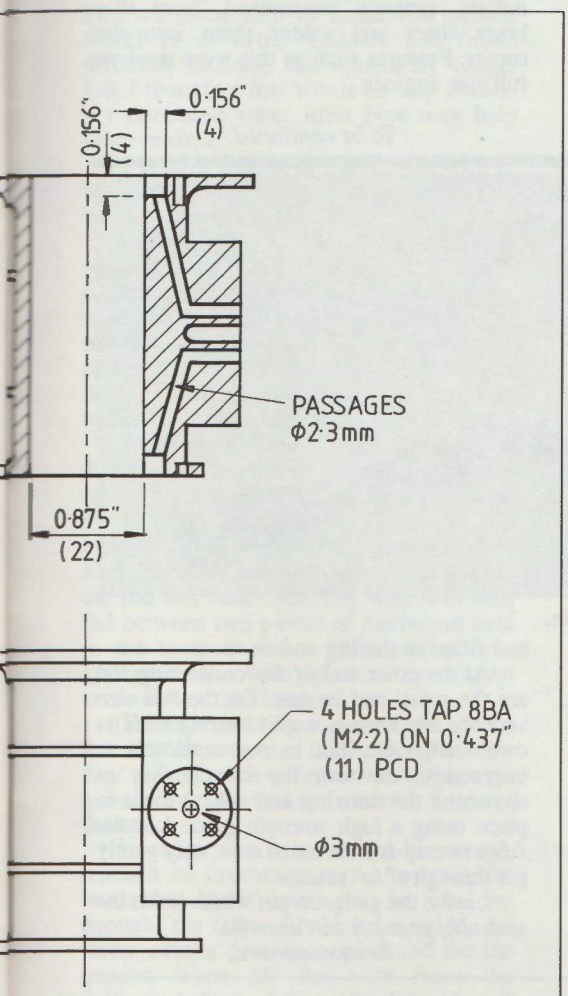


The initial set-up for machining the casting – mount on a mandrel to machine the two end faces.



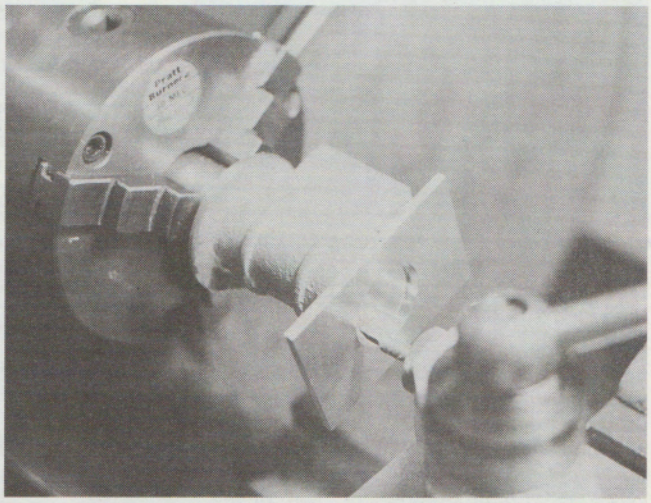
The casting set up on the faceplate for boring. Note the use of a sacrificial piece of plywood to avoid cutting into the faceplate.

a machine vice and the pockets for the steam passages milled in. Some packing will be needed to keep the vice jaws clear



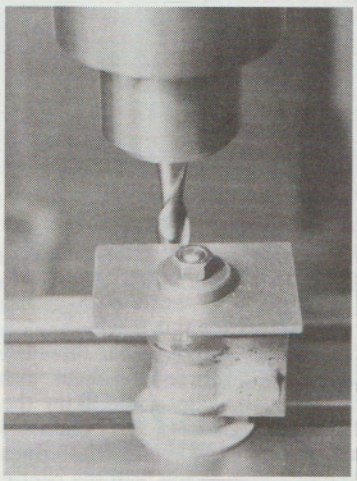
of the flanges. To avoid compressing the bore and to give a firm grip the packing should be hollowed out to fit around the cylinder body like a saddle. The passages themselves are drilled using a wooden wedge to support the cylinder to achieve the correct angle. The cylinder is screwed

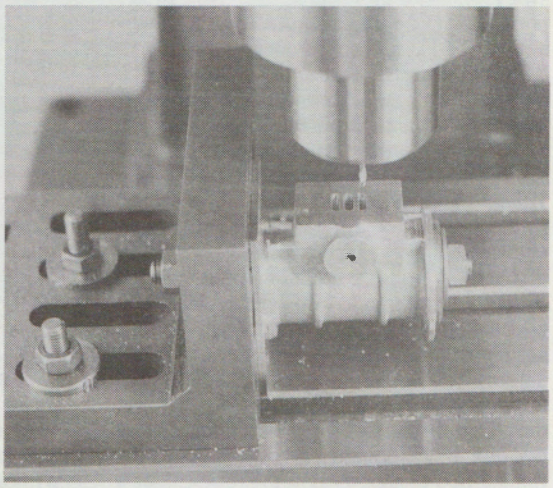
Right: Counterboring the end of the cylinder bore to accept the cylinder cover (see text).



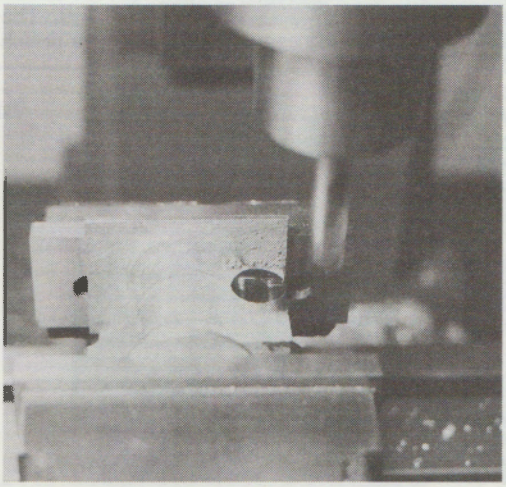
Below: The set-up on the milling machine for profiling the rectangular end of the cylinder.

Below right: With the end face mounted to an angle-plate, the steam and exhaust ports can be machined.

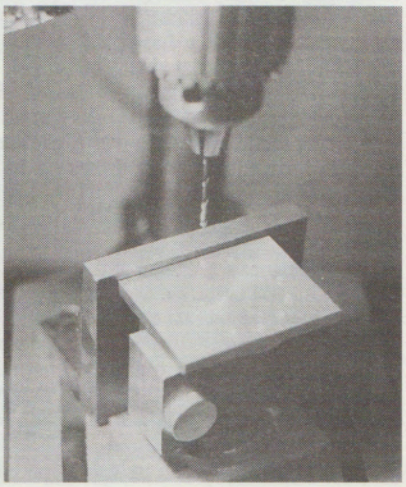




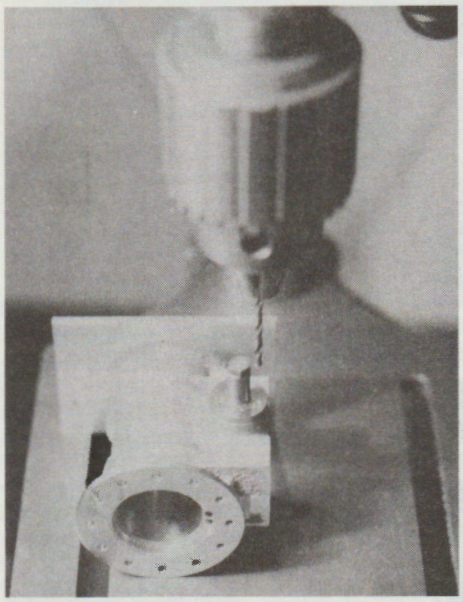
Right: Machining the face of the exhaust flange.



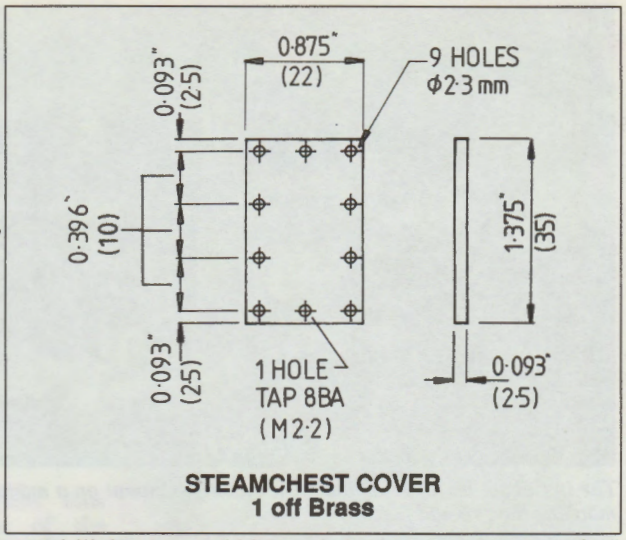
Far right: Using the table as a jig for spotting through the holes into the underside of the cylinder casting.



to the wedge. Finish off the cylinder by drilling the exhaust passage to connect with the exhaust port and the four flange stud holes can be drilled and tapped. My final photograph of the sequence of machining the cylinder shows the exhaust



Spotting through the exhaust flange for the flange securing studs – see text.



STEAMCHEST COVER
1 off Brass

flange being used as a template to drill the stud holes. It is held in place by a bolt passing through the bore and into a tapped hole in the cylinder.

The steam-chest cover is a piece of $^{3}/_{32}$" (2.5mm) brass sheet, squared up all round and drilled for the stud holes. This cover does look rather plain, and to give it a little distinction a $^{1}/_{32}$" (1mm) deep sinking could be made in the centre leaving a $^{3}/_{16}$" (5mm) band around the outside. As an added feature you could cut out your initials, perhaps intertwined, from thin brass sheet and solder them into the recess. Features such as this were used on full size engines.

To be continued.

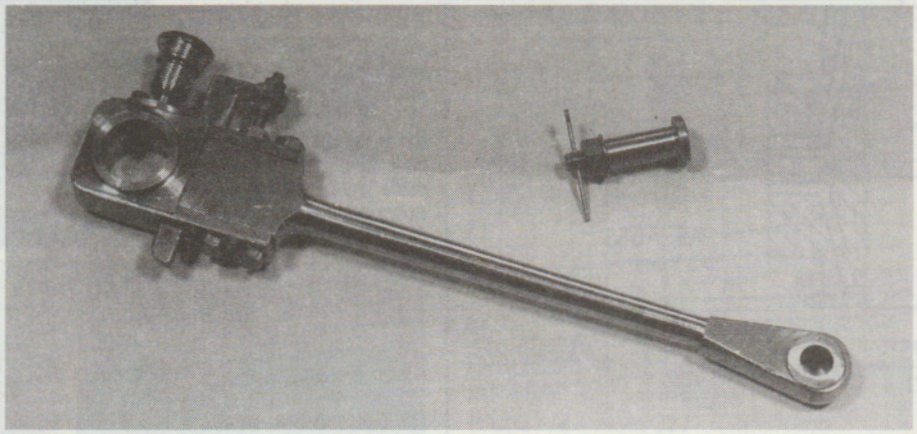
ROBEY'S No. 4 LIGHT TRACTION ENGINE

Continued from page 91

the work and lock it. By holding the pin vice in the fingers and sliding it along the drill into the work one now has total control and almost perfect 'feel'. The pin vice can be quickly and easily retracted to clear swarf and no more pressure than finger pressure can be applied, but care does still have to be exercised. Of course, as with all drills, a centre or starting point has to be made otherwise the drill will most assuredly wander and break.

The last operation on the oiler is to shape the bolting flange and drill the two 10BA clearance holes. It will also be necessary to spot these holes on to the big end strap; however, because of obstruction, this cannot be done directly from the oiler. A way around this is to produce a footprint of the flange on the end of a strip of mild steel – in place of the $^{1}/_{8}$" spigot is a $^{1}/_{8}$" diameter hole. The oiler can then be fitted to the footprint, the 10BA holes drilled into the flange from the footprint and, whilst the two are held together by 10BA bolts, the flange filed to shape using the footprint as a filing guide. The photograph shows that mine was only half a footprint, so that the oiler had to be rotated to complete the profile. This same footprint is then used as a drilling guide on the big end strap, a $^{1}/_{8}$" rivet being pushed through the $^{1}/_{8}$" diameter holes to locate it. Spot the holes on to the strap and then drill and tap 10BA. Short pieces of studding can be Loctited in place to hold the oiler.

The final item to make at this end of the connecting rod is the oiler cap. The method of manufacture is as for the crankshaft bearing oiler caps. Turn a short length of brass to $^{11}/_{32}$" outside diameter, then drill 6.5mm and tap $^{9}/_{32}$" × 40 tpi. The depth of tapping is unimportant but the $^{1}/_{8}$" long collar which is now parted off must be properly threaded all through. Set this collar



The completed connecting rod and gudgeon pin.

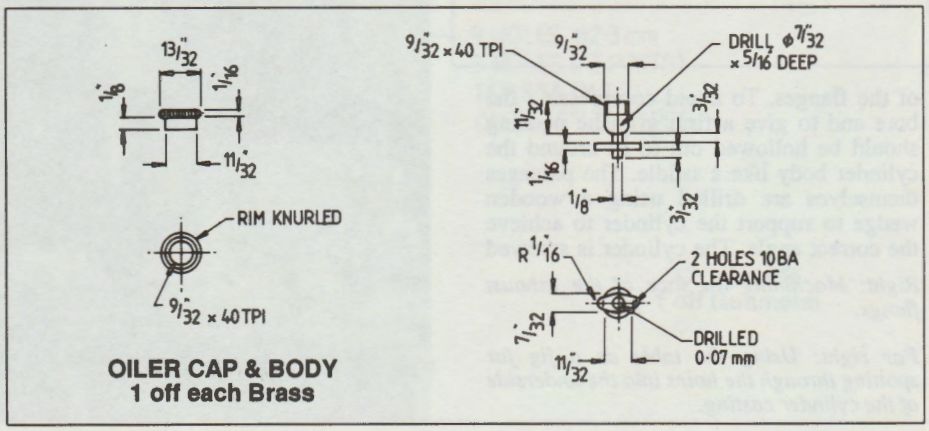
down on a small piece of 16 swg brass and lightly silver solder them together, 'lightly' meaning enough to hold the components but not enough to fill the threads inside. Quench and remove the flux residue.

Mount a short length of bar threaded $^{9}/_{32}$" × 40 tpi in the three-jaw chuck and screw it on to the oiler cap. Skim the edge of the 16 swg top to $^{13}/_{32}$" diameter and knurl it. Lightly chamfer the edges with a vee thread tool and drill the centre of the cap with the 0.70mm drill. The brass work can now be given a polish and fitted to the big end strap.

At the other end of the connecting rod are the small end bushes. On the full size version, this bush is a split bearing with its own wedge etc, but in our scale this is impractical. So turn the two bushes as shown on the drawing and adhere them in place using a high strength grade Loctite. After twenty-four hours to cure, very gently put through a $^{7}/_{32}$" reamer.

Lastly, the gudgeon pin which holds the assembly together can be made.

To be continued.



OILER CAP & BODY
1 off each Brass

ARMOURING A WATER LIFTER PIPE IN 2" SCALE

Alf Davies

Whilst on duty in the model tent at the Whissendine Rally in June 1997, I was asked by at least half a dozen people how I had armoured the rubber water lifter pipe on my 2" Fowler traction engine which has been built to the Malcolm Frost design serialised in *Engineering in Miniature* a while ago.

I referred each person to Malcolm's description as to how he did his water lifter pipe in the appropriate issue of *Engineering in Miniature*, but added that I had not been able to make his method work! If so many builders had found difficulty in doing this apparently simple job, I thought a few words on how I made my armoured water lifter pipe may help other readers.

I bought a hank of galvanised wire of the appropriate diameter from my local hardware store.

In the lathe, I centred a length of steel rod, the rod being slightly smaller in diameter than the rubber pipe I was going to use as the water pipe because, when the tension is taken off the coiled wire, it opens up a little. The rod was then held in the 3-jaw chuck and located at the other end with a centre mounted in the tailstock.

A small hole was drilled through the diameter of the rod to allow a reasonable fit for the wire. The lathe was then set on the slowest back gear speed and a gear train was set up to give a screw thread of 8 tpi. The wire was fed through the hole in the rod and bent over. The wire was then fed between two pieces of hardwood held in the toolpost and a little tension was applied to the wire by winding out the cross-slide a fraction.

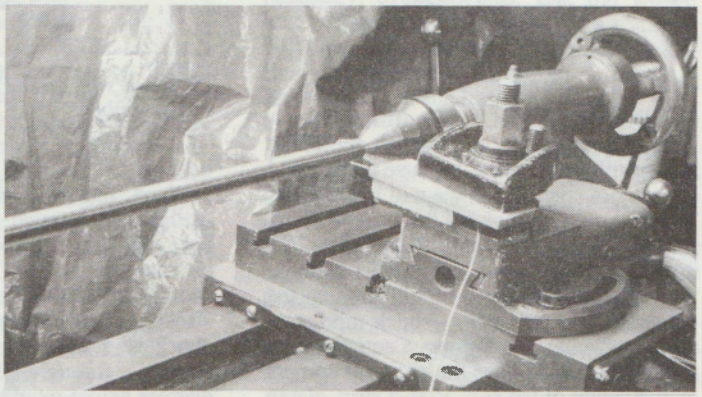
The lathe was then started and after a few revolutions, put in the screwcutting gear. The first few turns winds the wire closely together and gives a nice finish to the coil.

If, when the lathe saddle has nearly reached its maximum travel towards the headstock, the formed coil is not long enough, the lathe should be stopped, the screw-cutting gear uncoupled and the the tension taken off the wire from the toolpost before sliding the formed coil tight against the tailstock centre while winding the saddle back to the tailstock. Then you can start all over again. I had to do this sequence three times!

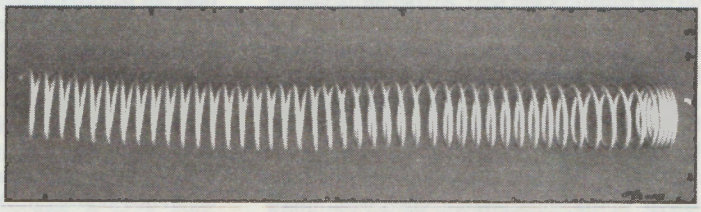
When I thought I had produced a sufficient length of the coiled wire 'spring', I stopped 'screwcutting' and allowed two or three turns of the lathe to finish the 'spring' as at the start of the operation.

Both ends of the wire were then cut, the coil slid off the bar and eased on to the rubber pipe.

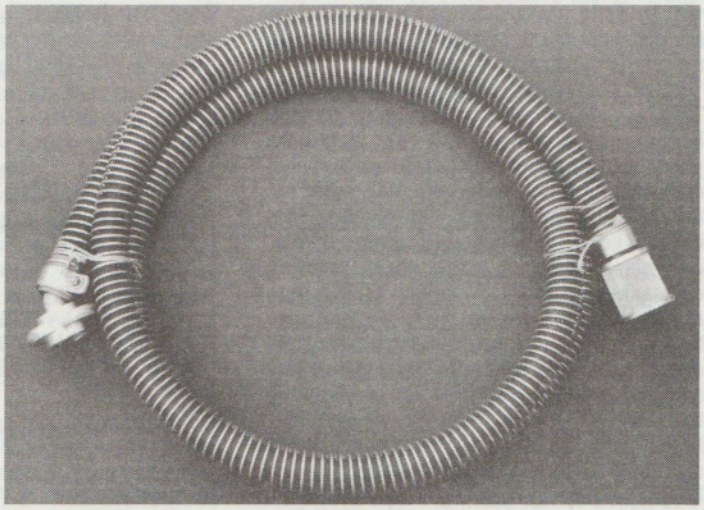
One last word of warning – make sure that the toolpost doesn't snag anything, and keep your fingers out of the way!



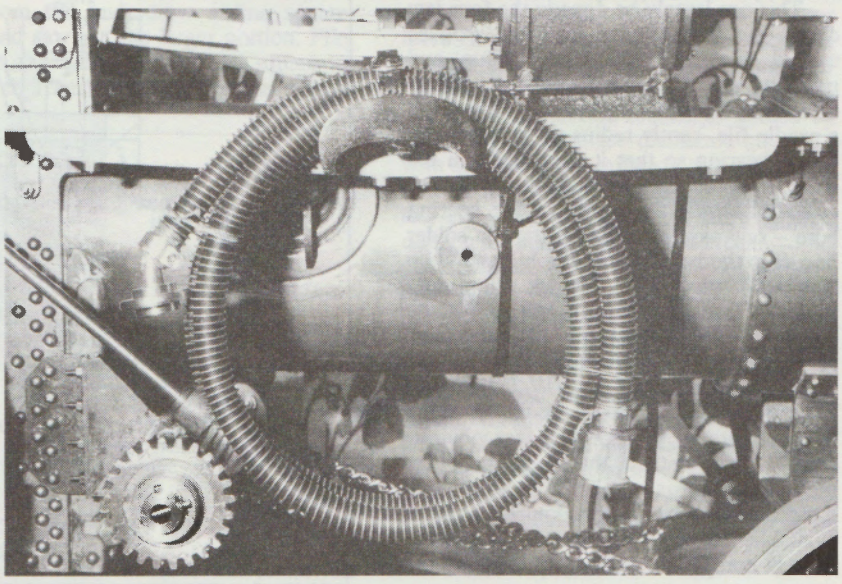
The set-up on the lathe for winding the coil – wire is fed from the loop on the floor, so watch your feet!



The test piece to try out the method. Note the three or four coils before starting the 'screwcutting' to give a nice foundation for the brass clips on each end.



Right: The completed water pipe complete with engine connector and filter.



Below: The pipe hung in position on the engine. It is retained with a modified lady's watch strap.

Robey & Co. Ltd

No. 4 LIGHT TRACTION ENGINE

A design in 2" scale by IAN AMOR

Part Thirty-three

CONNECTING ROD (Continued)

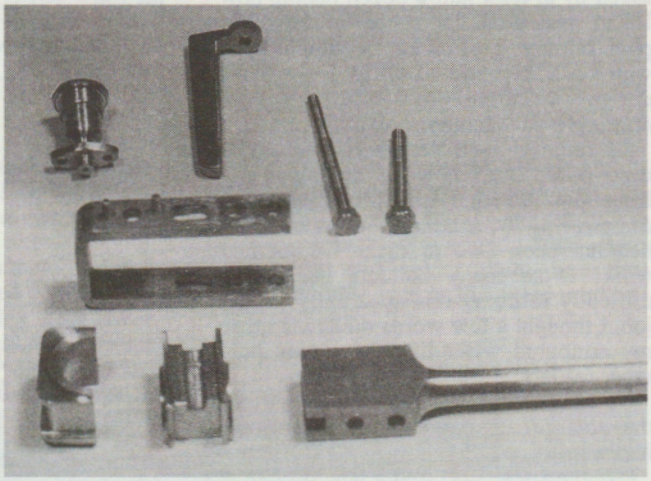
It is quite unimportant which end of the rod is built up first but, because the big end is the more spectacular, we will begin there. The first piece to make is the big end strap. Mill a block of metal of at least $^5/_{16}$" thickness to $^9/_{16}$" wide and at least 2" long. Square one end and lightly radius the corners. Cut a strip of $^3/_{32}$" thick mild steel sheet $^5/_{16}$" wide and 4" long. Centre the end of the block which has the radiused corners on the length of the $^3/_{32}$" × $^5/_{16}$" strip, clamp in the vice and bend the two leaves of the strap into a U shape. These two leaves need to be knocked down close so that they are parallel and exactly $^9/_{16}$" apart. Before bending, check that the strip is square to the block because if it is not, the leaves of the strap may be $^9/_{16}$" apart but they will be askew in the other plane. When bent, there will be little protrusions at the corners, so file these off, cut the leaves to length, polish the whole thing up and set aside.

The next item is the big end bearing. This is made in the same fashion as all split bearings by soft soldering two pieces of phosphor bronze or gunmetal together and then treating it as a solid item, only splitting the bearing apart after completion. For those who do not have a treasury of old castings or saved chucking stubs, or even club sale acquisitions, a piece of $^3/_4$" diameter phosphor bronze bar $1^5/_8$" long can be squared up in the milling machine and cut in half, but before the two pieces are soldered together, each piece can be brought to width – $^3/_8$" and $^{13}/_{32}$" respectively. The height and thickness should be left over size. Soft solder the two pieces together and begin the shaping.

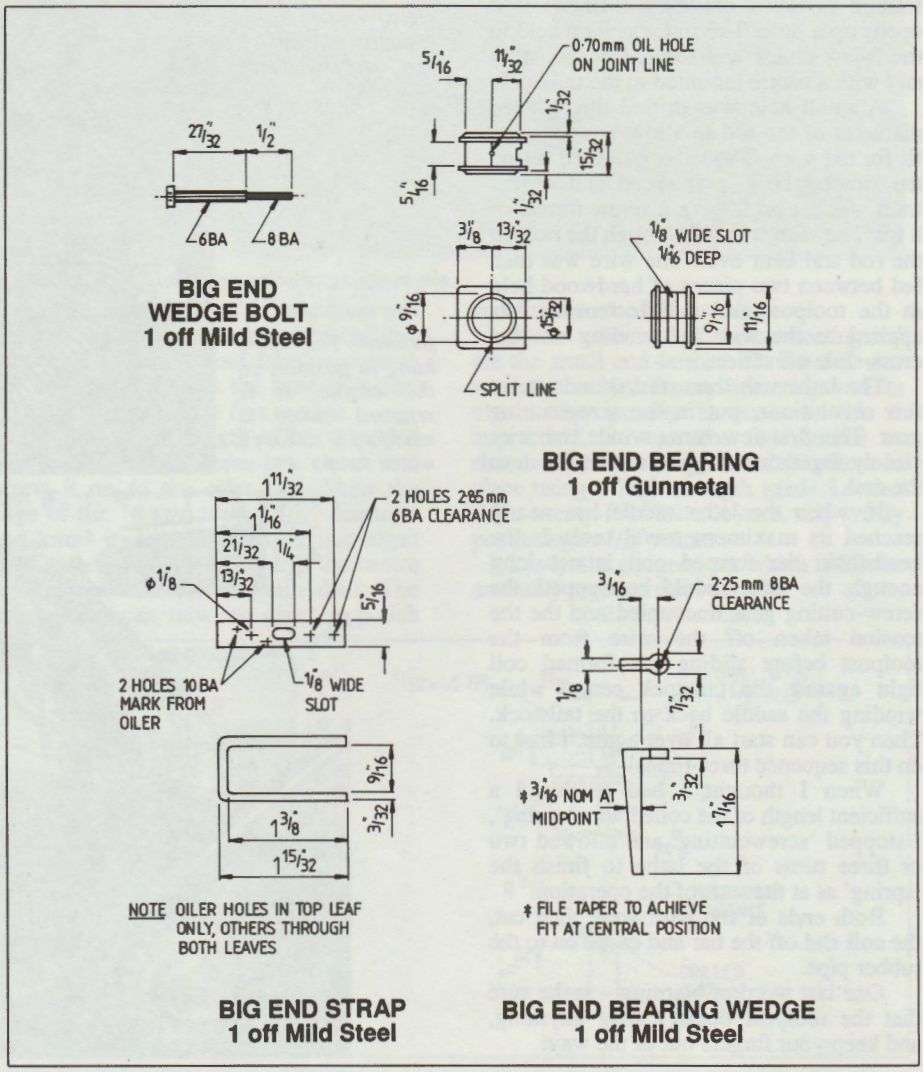
This can largely be done in the four-jaw chuck but, because of the $^5/_{16}$" grooves around the sides, the squaring up and grooving are just as well done by milling. Check the fit in the big end strap and, with a needle file, gently radius the rear corners of the bearing so that it fits snugly in the strap. With the external shaping completed, accurately mark the centre of the bearing bore – one axis of course being the solder line. Slip the bearing into the big end strap and put a piece of $^1/_8$" thick aluminium packing into the front groove – the assembly can now be mounted in the four-jaw chuck. Set the marked centre to run true and drill and bore out to $^{15}/_{32}$" diameter.

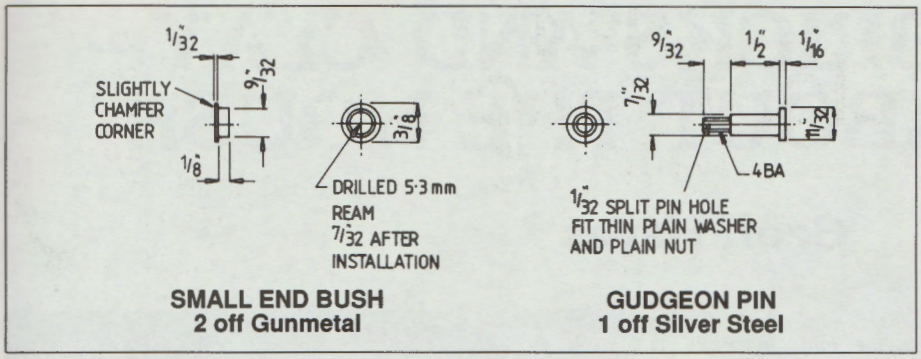
It is not possible to check the fit of the bearing bore to the crankpin for obvious reasons but, rather than just rely on measurement, it is best bored to a gauge. If a piece of the original crankpin material is available, so much the better. When the bore is completed, relieve the face of the bearing by just $^1/_{32}$" to produce the $^9/_{16}$" diameter collar around the bore. To turn the collar on the other side, it should be possible to slacken two adjacent chuck jaws and spin the bearing through 180 degrees before retightening the jaws. However, it is best to check with a clock gauge before actually cutting metal.

Exploded view of the big end assembly.



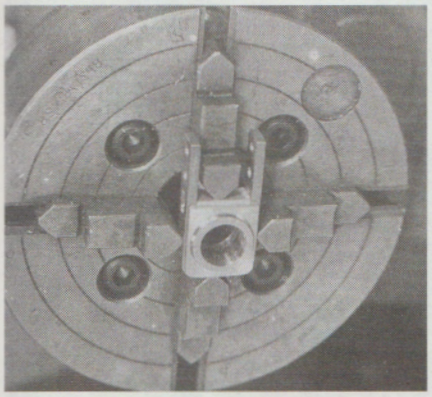
Separate the bearing and strap and on the strap, mark the position of the 6BA clearance holes on the top leaf only. Drill these two holes and then reassemble the bearing in the strap and then fit them together with the connecting rod. With everything pushed up firmly and in line, put


0·70mm OIL HOLE ON JOINT LINE
6BA
8 BA
BIG END WEDGE BOLT
1 off Mild Steel
SPLIT LINE
1/8" WIDE SLOT 1/16 DEEP
BIG END BEARING
1 off Gunmetal
2 HOLES 2·85mm 6BA CLEARANCE
2 HOLES 10BA MARK FROM OILER
1/8 WIDE SLOT
2·25mm 8BA CLEARANCE
NOTE OILER HOLES IN TOP LEAF ONLY, OTHERS THROUGH BOTH LEAVES
* FILE TAPER TO ACHIEVE FIT AT CENTRAL POSITION
BIG END STRAP
1 off Mild Steel
BIG END BEARING WEDGE
1 off Mild Steel



SMALL END BUSH
2 off Gunmetal

GUDGEON PIN
1 off Silver Steel



The set-up for boring and facing the big end bearing.

on a toolmakers clamp leaving one of the 6BA holes clear, but before drilling put a piece of $^{15}/_{32}$" rod through the bearing hole and check that it is square to the connecting rod. Set this assembly into the drilling vice with the connecting rod horizontal and with its flank truly vertical and drill the first 6BA clearance hole fully through. Put in a 6BA bolt and nut and move the toolmakers clamp to allow access to the second hole. Do not try to drill the second hole without refitting the toolmakers clamp and re-checking for squareness.

The front clamping bolt is a standard 6BA bolt (with the standard one size smaller head) but the rear one, the big end wedge bolt, is one which has to be made. It may still be possible to obtain BA A/F hexagon rod from some suppliers – I bought a supply some years ago. If not, then even the hexagon is going to have to be made. At this point, it is well worth marking the position of the split line of the big end bearing and the extremities of the wedge grooves on the big end strap.

Mark out the $^1/_8$" wide slots in both leaves of the big end strap, having regard for the positions just marked, and mill the slots. Cross the bearing split line on the top leaf only on the centre line of the strap, centre pop and drill through 0.70mm. Re-assemble all three parts again, checking the alignment of the slots in the strap with the slots in the bearing and the connecting rod. Drill through the 0.70mm hole into the big end bearing. Take the whole lot apart again and, if the slots need attention, give it to them and also open out the 0.70mm hole in the top leaf of the strap to $^1/_8$" diameter. The big end bearing can also be split and the soldered faces lightly rubbed on a very fine file. It is at this stage that the fit of the big end bearing can be tried on the crankpin.

If the bearing does not fit what do you do? Firstly it can be re-assembled into the strap and then into the four-jaw chuck to be bored out further; secondly it can be reamed with an expanding reamer, although boring is the better method. Before any of this though, check whether it is a burr which is preventing a proper fit or, more likely, if the edge of the bearing bore which has a sharp square edge is being held away by a slight fillet where the crankpin meets the crankweb. Look also to see whether a gentle lapping with something akin to metal polish will not ease the fit. If none of these work, then further machining may be the only answer! If, on the other hand, both halves fit but the bearing binds when the two halves are pressed together, then machining definitely is **not** required, just careful adjustment of the wedge.

Re-assemble the bearing, big end strap, connecting rod and bolts all ready to accept the wedge.

To make the wedge, take a piece of $^1/_4$" thick mild steel about $^3/_4$" wide and 2" long. Draw a line on one face $^5/_{16}$" from one edge and parallel to it for $1^7/_{16}$" from one end. At $1^7/_{16}$" from the end, draw a line square across and saw out the larger portion. File the sawn faces smooth, flat and square to each other. Transfer the work to the milling machine and mill off $^1/_{16}$" from each face along the blade just formed and extend the thinning $^1/_4$" or so back along the full width stock. The edge of the cutter may overhang the filed edge, but leave enough of the full thickness to form the bolting eye.

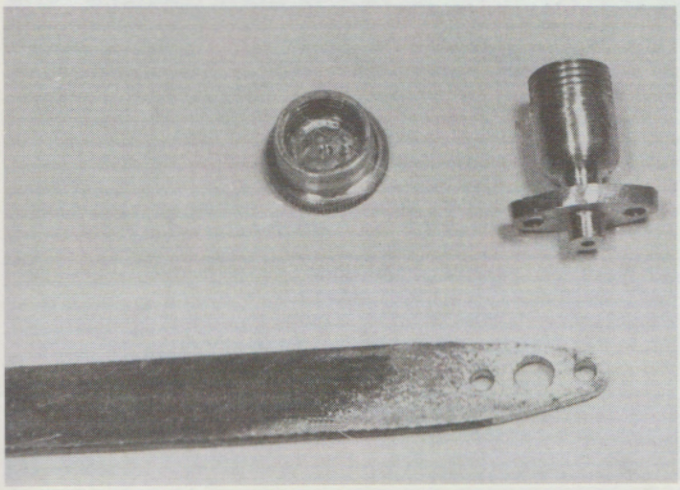
Whilst there is still a thick end attached to use as a handle, file the blade to fit the slot and put pressure on the bearing with the eye at or about the position shown on the general arrangement drawing. It will be necessary, even obvious, that the wedge bolt will have to be replaced by a standard bolt during this process. Once the wedge is fitted, it can be sawn off the stock, the 8BA hole drilled and the head of the wedge filed to shape.

That only leaves the oiler and cap to be made to finish the big end. The oiler is turned from a piece of $^1/_2$" diameter brass bar, so begin by reducing the end to $^9/_{32}$" diameter by $^7/_{16}$" long. Centre the end and drill in $^7/_{32}$" diameter by $^5/_{16}$" deep and thread the outside $^9/_{32}$" × 40 tpi. The ideal way to form the neck and rounded bottom of the cup is by making and using a form tool. If, instead of bodging or busking the job, you make the tool, eventually half a drawer full will have been accumulated so that usually something will be found to do a similar job in the future.

The flange is brought to thickness and the $^1/_8$" diameter locating stub produced at the same time with a parting tool. The tool is then moved towards the chuck and the whole lot parted off. Remove the $^1/_2$" stock from the chuck and mount the oiler by the oil cup and with the flange hard against the jaws. If it necessary to adjust the diameter of the locating stub or face the flange, do so using a freshly sharpened tool and light cuts. The main reason for putting the oiler in the chuck is to drill the 0.70mm hole.

A little information for the beginner. A 0.70mm drill in the old number size range is a No. 70 and is twice the size of a No. 80 and the No. 70 at just under 0.028" in diameter is already quite small enough! And another thing, just because they are small does not make them cheap! To return to a more serious note, for drills this size the model engineer has all the chips stacked against him. To begin with, the recommended spindle speed for a drill of this size is in the region of 15,500 rpm, but my lathe on a good day will make just 650 rpm. For drills in what I can only describe as our more 'normal' sizes, there is a reasonable amount of 'feel' or feedback through the machine. One can sense when they are cutting or not and so breakages should be fairly rare. With these diameters however, with the drill in the tailstock chuck, nothing will be felt – they are just too small. This can lead to too much pressure being applied causing the drill to buckle and break.

However, there is a way of making them work well and without breaking. Obtain an Eclipse No. 121 pin vice. This is a small chuck with a capacity of up to 0.040", mounted on a knurled hollow handle. Select a drill which is a close sliding fit inside the handle, or get very posh and turn a purpose-made mandrel. Put the big drill in the tailstock chuck and the small drill in the pin vice. Slide the one over the other and bring the tailstock up to



The oiler and cap with its associated footprint.

Continued on page 88

TIMBER, BRICKS AND CLAY – STEAM ABOUT THE HOUSE

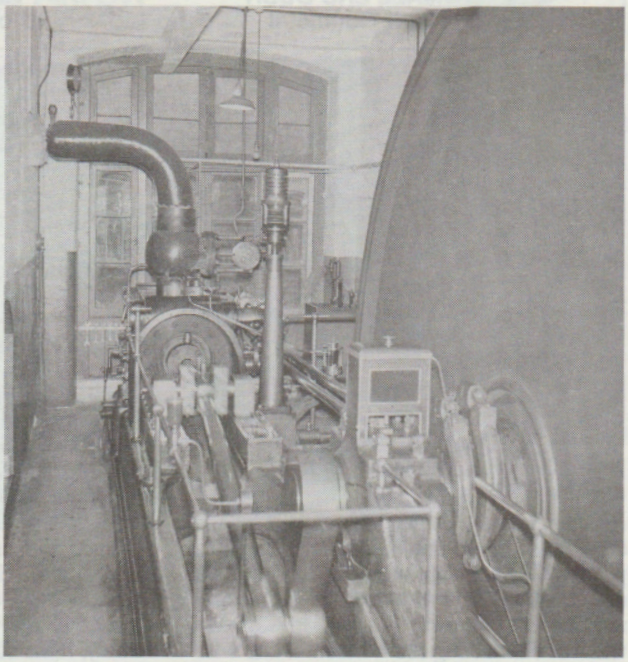
Geoff Hayes

With the popularity of Corliss engines in Britain, it was inevitable that engines of this type were used in brickworks. They were far less common than in the textile industry and it is, perhaps, safe to say that they were quite uncommon in this industry.

A classic single cylinder horizontal Corliss engine built by an equally classic textile mill engine builder drove the Trefor Brickworks in North Wales. Pollit & Wigzell of Sowerby Bridge built the engine in 1923 and it had all the features associated with their textile mill engines. Claw type trip gear was always used by Pollit & Wigzell, the claws being driven by rods from an oscillating wrist plate mounted on the side of the cylinder. The wrist plate, in turn, was driven by eccentric and rods from the crankshaft. Cut-off was determined by a Whitehead high speed governor. A second wrist plate, driven from a second eccentric, operated the exhaust valves which were thus open for a fixed period irrespective of cut-off. In textile mill engine fashion, the Trefor engine had the arms of the flywheel boarded in to reduce windage and the drive to the works was by ropes from the flywheel.

When this engine ceased work, it was procured by the Ironbridge Gorge Museum and, although not now driving brickworks machinery, it was put to work driving a stand of ironworks rolls for demonstration purposes and can therefore be seen at work at regular intervals.

Hick, Hargreaves of Bolton were early in the field of building Corliss engines in Britain. One of their tandem compounds built in 1883 was in use at the Ashgrove pipe works at Elland until 1976. It was fitted with one of the Hick, Hargreaves forms of trip gear on the admission valves, although this was not the Inglis & Spencer gear with which Hick, Hargreaves were so long associated. After a very hard life, the engine was removed by a museum but so far has not seen the light of day.

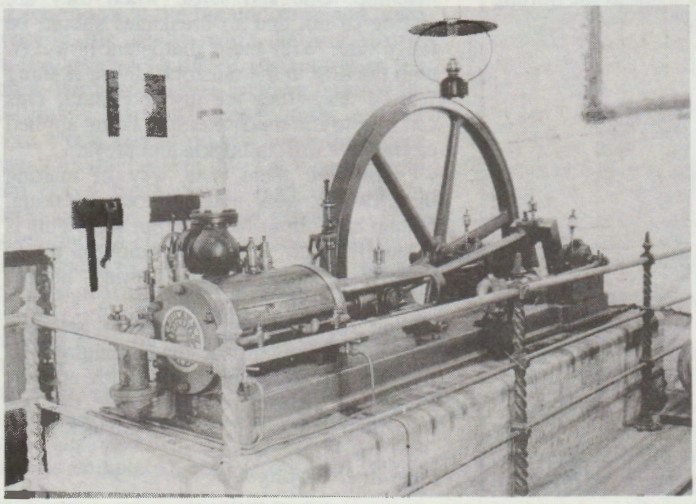


Single cylinder Corliss engine built by Pollit & Wigzell of Sowerby Bridge at work at Trefor brickworks. Photograph by the late R A S Abbott.

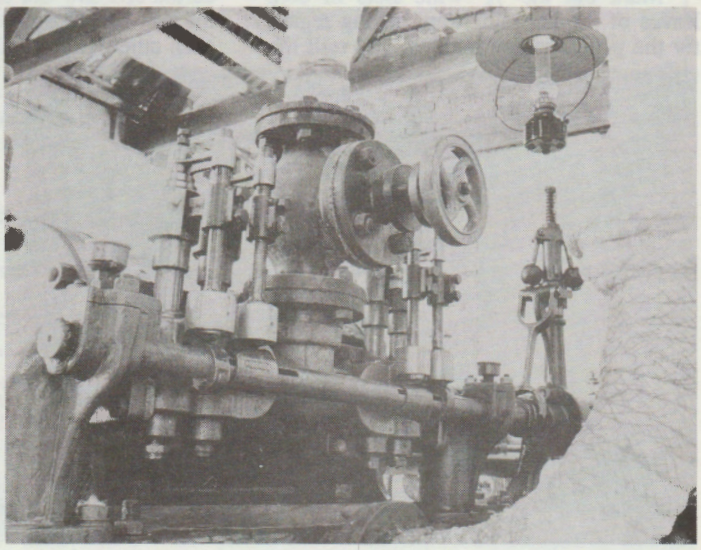
As in the timber trade, drop valve engines were also to be found in the brick and pipe making industry. Robey & Co. were very early manufacturers in Britain of drop valve engines. They commenced building engines of the general Sulzer type in 1887, the valve gear being to a recent patent (1887) by Richardson & Rowlands. The firm went on to build thousands of engines of this type. Robey & Co. had in fact commenced building engines with drop valves in 1884, but these had Proell valve gear and were not of the Sulzer genre.

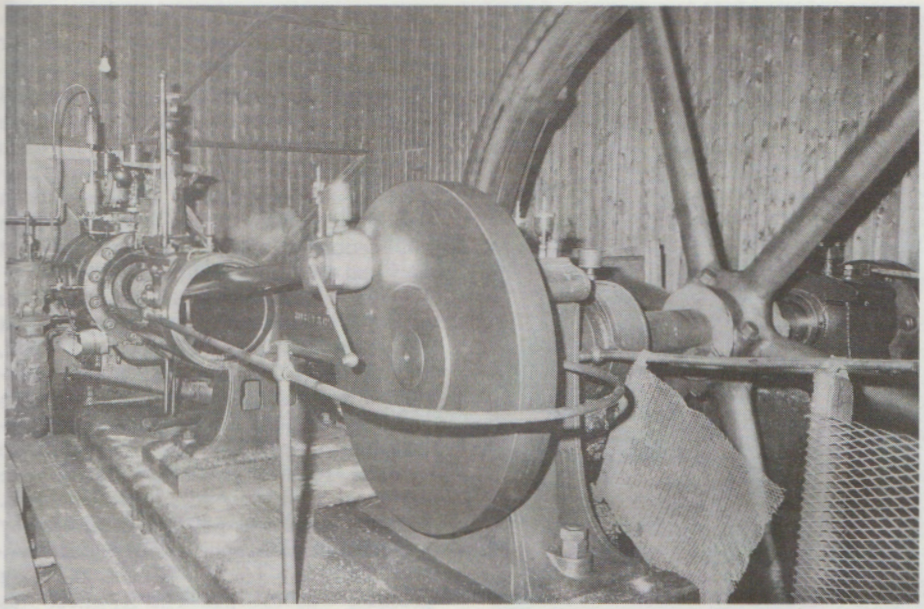
Drop valves interested many manufacturers and firms which are now quite obscure often had a go at making drop valve engines. Not all were of the Sulzer form, and a remarkable survivor of the products of these lesser firms is an engine built for a brickworks by W & F Wills of Bridgwater, Somerset. Walter and Frank Wills had set up business as engineers in 1876 and their patent for drop valve engines dates from 1886 when this engine was built. The valves for steam and exhaust are placed at the side of the cylinder and are operated by cams, the admission valves being under governor control. To vary the cut-off, the position

Drop valve engine with valves at the side of the cylinder and with governor controlled cut-off gear, built by W & F Wills, Bridgwater in 1886 and now seen at Westonzoyland Pumping Station.



Valve gear of the W & F Wills engine.





Robey drop valve engine with Richardson & Rowland's patent trip gear at Newport brickworks, Yorkshire. It has a 15" × 33" cylinder and a flywheel 11 ft in diameter, running at 86 rpm. Photograph courtesy of Colin Bowden.

of the admission cams is altered by the governor. The cylinder of this modest sized engine is 9" x 18" and the flywheel is approximately 7 ft diameter. By very good fortune, W & F Wills retained an interest in this engine and took it back to their works when the brickworks closed in the 1950s. The firm itself closed in 1983, having been wholly owned by Stothert & Pitt for some years. Again by good fortune the engine had been previously acquired by the Westonzoyland Engine Trust and is now displayed at the Westonzoyland Pumping Station. Restored to full working order, the engine is regularly run under steam.

Returning to the Sulzer type engines made by Robey, a single cylinder drop valve engine with Richardson & Rowlands valve gear was installed about 1925 in the Newport (Yorkshire) brickworks. It had been built in 1900. At Newport it drove a pipe extrusion mill and an incline which took small trucks of clay from the pit to the top of the works. The engine was still working in 1973 and was subsequently removed by Newcastle-upon-Tyne Museums, but unfortunately it has not been re-erected.

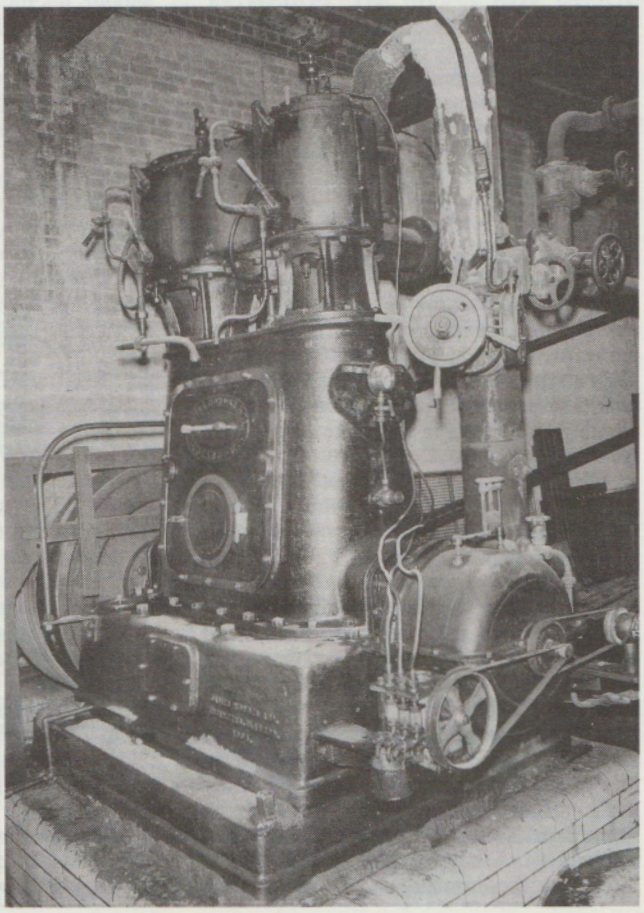
A similar Robey drop valve engine worked at the Sevenoaks brickworks until 1978 and was later removed by the Kew Bridge Engines Trust. Again this has not so far been re-erected and a cracked bed will need to be repaired before this is done. As this type of engine is so important in the history of engine building in Britain, it is worth noting that an engine has been preserved by the Robey Trust, although it is not from a brickworks. This engine may be seen running at the Launceston Steam Railway in Cornwall whenever the railway is operating.

In stationary engine practice, piston valves were not very common. Their use was mainly confined to high speed engines and to engines where reversing was required. A few of the textile mill engine builders used piston valves on the low pressure cylinders of their compound and triple expansion engines.

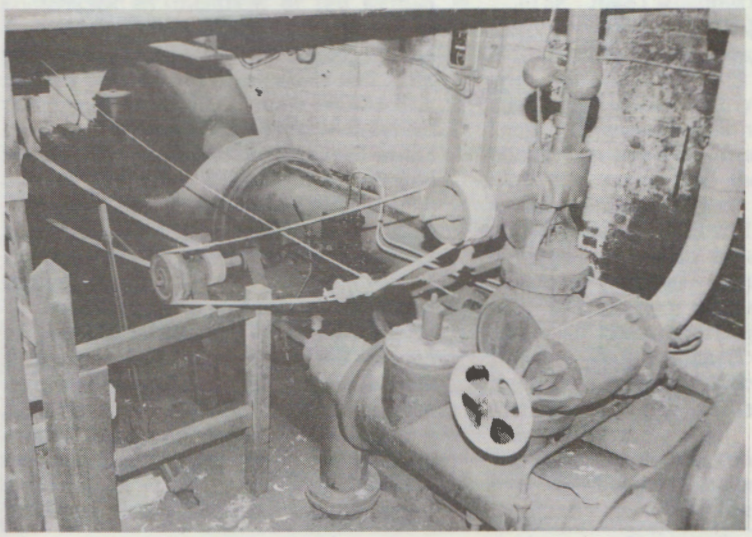
Bretby Brick & Stoneware works had a single cylinder horizontal engine with a piston valve. It was fitted with Stephenson's link motion but, as it had been out of use for quite a long time, no one could tell me why the reversing gear was needed. Possibly its duties included operating a haulage system where the ability to reverse out of a pile up could be useful. Apart from the provision of reversing gear, the engine was fairly ordinary. The cylinder was about 15" × 30" and the engine was partially enclosed. Trunk crosshead guides were provided. Power was transmitted to the works by five ropes from the flywheel and speed control was by Pickering governor acting on a throttle valve. The engine had been built in about 1922 by Walker Bros. of Pagefield Ironworks, Wigan, who were very well known as manufacturers of engines for the mining industry.

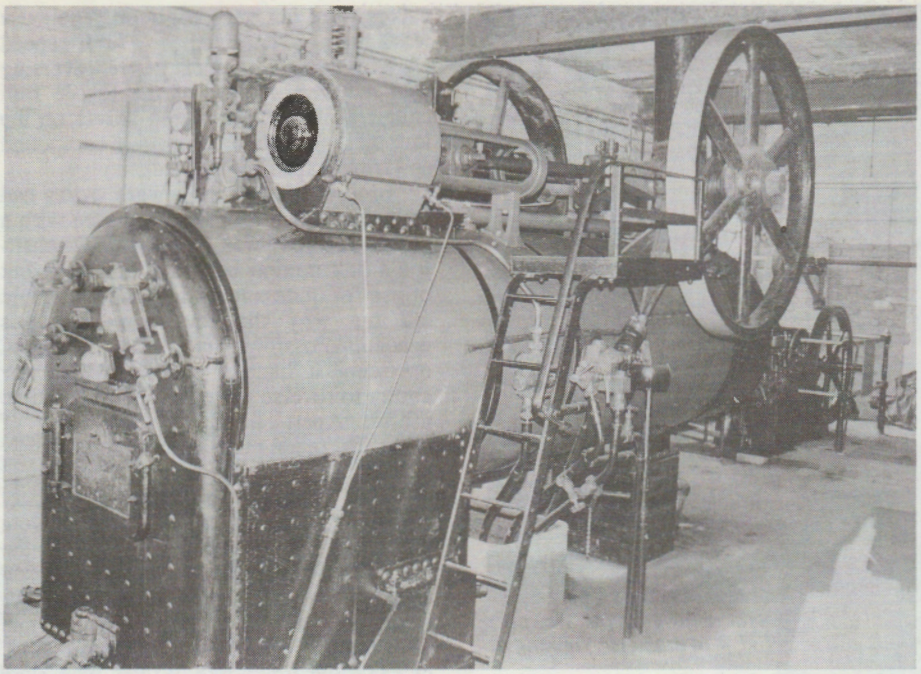
High speed enclosed engines were employed in some brickworks and not always coupled to electrical generators as was the more familiar application of these engines. There were instances where the engines were used to drive lineshafting with belt or ropes. Flixton brickworks, on the western fringe of the Manchester conurbation was one place where a high speed enclosed engine was applied in this manner. Originally a Browett, Lindley engine was installed but this was later replaced by a Belliss & Morcom compound engine which was still working

Right: High speed enclosed compound engine at Whitebrook tile works, Darwen, Lancashire. Built in 1906 by James Howden of Glasgow, the engine drove lineshafting with V-belts. Photograph courtesy of Colin Bowden.



Below: The piston valve single cylinder engine at Bretby Brick & Stoneware works. The engine was built by Walker Bros. of Wigan.





Semi-portable single cylinder overtype engine built by William Foster, Lincoln, at Manor Brickworks, Raunds.

in 1978. It was non-condensing, exhaust steam going to the drying floors and worked at a very modest 80 psi. Steam was supplied at that time by an oil fired package boiler. Needless to say, this works has long been closed.

The use of semi-portable engines has been mentioned earlier in these articles when dealing with sawmills. They could also be found in brickworks. Manor Brickworks at Raunds in Northamptonshire possessed a semi-portable engine with an interesting history.

During the second world war, the Ministry of Supply commissioned a considerable number of portable engines and portable boilers. These were intended for emergency use in essential public services, especially water and sewage works, should the main power supply be put out of action by enemy bombing. Marshall of Gainsborough, Robey and William Foster, both of Lincoln, were all involved in the construction of these boilers and engines. After the war, when no longer required by the Ministry, they became a fruitful source of cheap steam and power where there was a suitable application, with the added bonus that they had seen little or no use.

The Manor Brickworks engine was one of the William Foster examples and it was built as a portable engine in 1942, Works No. 14736. For use at the brickworks, it was converted to a semi-portable and replaced an earlier Marshall semi-portable engine. The engine was single cylinder, $10\frac{1}{2}$" × 15", with a simple slide valve driven by an adjustable eccentric. Running speed was 150 rpm controlled by a cross-arm governor – a Foster feature – and throttle valve. Boiler working pressure was 150 psi. The flywheel was 4 ft 9" diameter by 9" wide for driving machinery by belt. At the brickworks a second flywheel was added which had come from an internal combustion engine. A locomotive type boiler with an ample grate area of 10 square feet supplied the steam.

For many years after closure of the brickworks, the engine was maintained in beautiful condition by the owner, who even went to the trouble of re-tubing the boiler so that it could continue to be steamed!

To be continued.

CONSTRUCTING A YEAR-GOING LONGCASE CLOCK – *Continued from page 71*

setting up the calendar work on the bench.

Because the pivots to be employed in the upper movement incorporate an adjustment for shake (end play), the effective height of the auxiliary pillars does not need to be held to quite such tight limits as for the main ones. Nevertheless, all four must be equal in length and, as for the main pillars, the spigoted ends must be true with one another.

Do not attempt to drill either the pivot holes or the 0.625" diameter hole for the adjustable bush, since their precise positions can only be determined by depthing once the actual arbors are available.

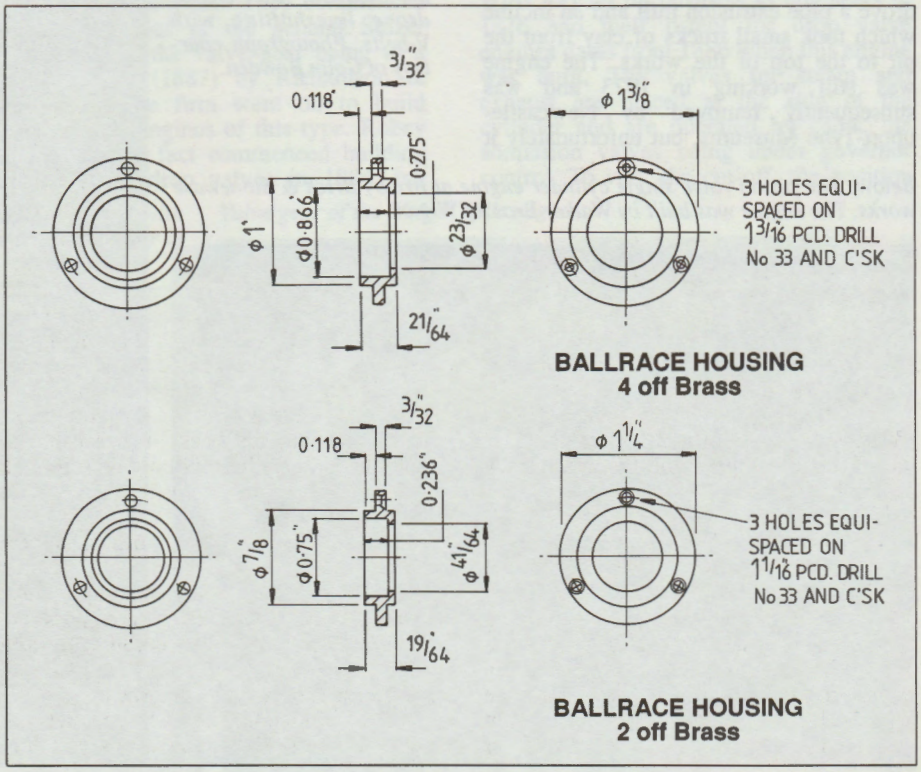
Whilst the spigots of both the main and the auxiliary pillars should be a good fit in their respective holes in order to hold the plates in true alignment, do avoid tight fits since during the construction of the movement the plates will have to be assembled and dismantled a number of times.

The housings for the ball races of the two barrel arbors and the second wheel arbor are straightforward turning jobs from brass bar. The 0.118" dimension for the depth of the spigots ensures that the housings, when fitted, will be flush with the inner faces of the plates for the movement. Likewise, the depths of the bores in the housings will allow their respective ball bearings to sit flush with this inner face.

The larger housing is designed to accept 8mm bearings whilst the smaller one is suitable for both 6mm and 7mm bearings. These bearings should be to hand before machining the housings and the aim should be to obtain a light push fit.

Leave the drilling of the No. 33 holes in the flanges until a later stage when these will be spotted through from the plates.

To be continued.



CLUB NEWSROUND

The colour light signalling along the back straight of the ground level track of **Birmingham Society of Model Engineers** is progressing well, with the signal heads completed and the 'feather' leading to the Low Level Station in position. Members are considering adapting some circuitry marketed by Maplin aimed at the smaller gauge enthusiast which will cope with two, three or four aspect signalling, though why four aspect signals should be adopted (apart from the prototypical accurate appearance) is not understood. At the speeds run at the track, three aspect signalling will be more than effective. The signalling may be completed in time for the National Locomotive Rally on the 12th-14th September 1997.

Visitors to **Bracknell Railway Society's** track at Jocks Lane cannot have missed the major structural changes and revised signalling, which have come about due to the need to adhere to the national policy of health and safety.

The Club Invitation Day held by members of **Brandon & District Society of Model Engineers** was a great success – especially the barbecue – despite the day being windy and overcast. Two traction engines, a steam lorry and numerous railway locomotives were kept busy all day. Several visiting enginemen thanked everyone from the club for making them feel very welcome.

The AGM of **Brighton & Hove Society of Miniature Locomotive Engineers** resulted in a change-around, with two new members on the committee, so fresh ideas on what the society should be doing are expected. The outgoing officers were thanked for their hard work over the last twelve months. A club activity which most members would like to see reinstated is the workshop evening. There are willing volunteers ready to act as supervisor and tool guardian, so the committee has authorised the expenditure of some funds to provide more small tools, drills, etc. and are now arranging a programme.

The new club diesel locomotive being constructed by members of the **British Columbia Society of Model Engineers** is progressing well. The snowploughs and coupler pockets are being made and, after painting, most of the 2" scale F40PH VIA type B-B locomotive will be ready for testing. The engine will be painted in the old two tone green BCR colours, but with Burnaby Central Railway lettering. It is hoped that the engine will be on the track at Confederation Park, Burnaby, B.C. later this year.

Following a 'day of action', members of the **Cheltenham Society of Model Engineers** have completed the ground level station platform and also the fencing from Hatherley station to, and around, the ground level station and part way along the ground level track towards the double arch bridge. Manufacture of the turnout frogs and blades will allow completion of the two remaining turnouts and then the remaining track laying can be completed.

The signalling being refurbished by Eric Lubke at the tracksite of **Durban Society of Model Engineers** continues, and Eric has been able to salvage a great deal of the existing cable. When he has found a source of cheap, or better still, free cable, he will be able to advise where to dig the trenching for the cables which should be run underground rather than to the rear of the anti-tip rail.

The 'Models at the Mill' exhibition held by members of the **Fylde Society of Model Engineers** at Marsh Mill, Thornton, was a success despite torrential rain most of the day. The marquee people were an hour and a half late arriving at the site, the outside entertainers did not turn up and, although the fast food outlet arrived, it only served a few people before it left. However, virtually everything was in place by the time the Mayor arrived to open the exhibition. There was a good selection of models on display covering a wide spectrum of modelling. Bob Shaw had made a mock-up of locomotive valve gear and spent quite a bit of time explaining it to interested visitors.

For some time now, the regular Track Gang of **Melton Mowbray & District Model Engineering Society** has been discussing the improvement of the club's tracksite and its amenities. A meeting was held on 2nd July in which members were asked what skills could be offered, although anyone coming along on Sunday mornings will be assured of good company and a warm drink. Offers of help may be telephoned to Gordon Williams, Track Manager, tel. (01572) 787517.

Members of **Mid Cheshire Society of Model Engineers** have completed the workshop and are finalising the steaming bays and turntable at their tracksite near Northwich. Power and water have been laid and tracklaying components are currently being fabricated to lay the 5"/7¼" gauge main line. The society has a new secretary, Geoff Johnson, telephone (01829) 760422.

The June Running Day held by members of **Milton Keynes Model Engineering Society** was a great success, with new member Nick Wirth bringing along his Hunslet quarry tank engine to keep "Gunnison' company. This was Nick's first trip away from his home line with this engine and the experience of loading it into the back of a transit van with the aid of a JCB will not be forgotten quickly! Nick also brought along two passenger vehicles, so the society was able to run two proper trains, a real challenge for the signalman. Heavy showers kept passenger loadings fairly light, but several runs were possible, including a double headed run with both trains of stock.

Steve Eaton has volunteered to take over as Midlands Regional Secretary of the **National 2½" Gauge Association**, and will be looking at events in the Midlands for the association's future programme. Although the 1997 national rally held at Cheltenham was dogged by copious rain, the morning was dry enough for three locomotives to run. Members came from Leicester, Nottingham, Stockport, Surrey, Warwick, Wolverhampton and Worthing. Unfortunately, the Westlands summer rally proved to be another day threatened by heavy rain, though the rally was well supported.

Marine group members of **North London Society of Model Engineers** will soon be able to use their launching pit by the boating pool. Only the steps have to be finished and the paving slabs laid. At a recent school fete, the stationary steam and traction engine group members gave rides behind three of their traction engines instead of the club using the portable track. This proved so popular that hopefully it will be repeated at other fetes in the future.

The 'Tuesday Gang' of **Norwich and District Society of Model Engineers** has made a number of improvements to the passenger trolleys and club facilities at the Eaton Park track. They have installed a water heater for hand washing and are now awaiting a quote to wire it up to the mains and update the club's main fuse panel. A sink installed in the main hut awaits a supply of hot water and a gutter is being added to the hut roof for the collection of rainwater for use by the locomotives. The trolleys have received new guard irons which, hopefully, will prevent any derailments from damaging the sleepers. The guard irons also hold the rubber guards away from the track.

The lease on the Goodwin Park site of **Plymouth Miniature Steam,** formerly Plymouth Miniature Steam Locomotive Society, has been renewed for a further ten years. Work done to the upper track circuit at the beginning of the year has improved this section, while the group have been given an amount of rail by one of the members which will be used in due course as a spur into the store. A large number of paving slabs donated by a non-member have been laid around the platform area, while fitting out the secure store continues, including racking for timbers, the erection of a secondary bench, construction of a shelf for the battery and charger for the signalling system, installation of various cupboards and the fitting of a storage unit at the back of the bench alongside a tool board.

Members of **Sale Area Model Engineering Society** are holding an Open Weekend on the 6th & 7th September. All visitors, with or without engines, are most welcome. Coal, oil, charcoal and water will be provided and refreshments will be provided free of charge. Running will begin from 10.00am on both days. The club's dual guage, fully signalled track is approximately 1,200 ft long and is situated in Walton Park, Sale, Cheshire.

Until the future of the site of **South Cheshire Model Engineering Society** is resolved, it has been decided to halt all major development work on the site but to continue with essential maintenance and safety work. Geoff Whittaker has completed his pressure gauge test rig and proposes to bring it to each meeting so members can test their gauges. It has not been unknown for a boiler to be ruined by someone testing the boiler with a faulty pressure gauge.

Members of the **Steam Locomotive Society of Victoria** have made steady progress on the pedestrian bridge over their track. Only three more stanchions have to be fitted and the handrailing can be moved out clear of the deck plates. Some of the garden areas which have become 'jungle' are being cleared for replanting with lower ground cover plants. Parts of both the ground level and elevated tracks have been repacked to correct levels and cant. Future plans include a rebuilt main 'char' storage area external to the green shed, with revamped tool storage to allow more area of the shed to be used as an expanded workshop.

For many members, spring was spent working on the track of **Stockholes Farm Miniature Railway.** Six new points were introduced into the circuit, while the Thursday team spent a day aligning and ballasting. The 'Duchess of Atholl' has been steamed again and the locomotive completed a number of circuits without incident. A start has been made on furnishing the main level crossing at the entrance to the site with a set of gates, while the entrance has been widened.

A very successful 'extended intermission' was attended by about sixty members and families/guests of **Toronto Society of Model Engineers** on Saturday 10th May, with a good turnout of models and tooling. An excellent lunch was provided, while president Don Carr put the hobby of model engineering in perspective for those who do not participate in the hobby but see it happening.

The Spring rally held by members of **Tyneside Society of Model & Experimental Engineers** started well with many visitors having an opportunity to run their locomotives. Unfortunately, the rain drove most people into the clubhouse or to shelter under the Blackgates awning to their trade stand. Sunday was wet until the late afternoon, but several visitors from Edinburgh and Strathavon clubs managed to run their engines.

Members of **Wirral Model Engineering Society** held their first annual general meeting as a limited company in April at its now regular meeting venue, Irby Cricket Club, Mill Hill Road, Irby, Wirral, Merseyside. The club now meets on the first and third Thursday evening of each month, with running at the track every Sunday during the summer, to which visitors are always welcome. The 3½"/5" gauge raised track is fitted with anti-tip rails throughout. All enquiries to the secretary, Mr J Meadows, telephone (0151) 648 2967 evenings.

Diary September

Details for inclusion in this diary must be received at least EIGHT weeks prior to publication. Please ensure that full information is given, including the *full address* of where every event is being held. Whilst every possible care is taken in compiling this diary, we cannot accept responsibility for any errors.

EVENTS OF INTEREST TO MODEL ENGINEERS

A comprehensive list of steam rallies and other preservation events can be found in the *Steam Heritage Museums and Rally Guide 1997/8*, available from TEE Publishing, price £3.50 including postage.

1 Peterborough SME, Bits & Pieces Evening, Thorpe Hall, Longthorpe, Peterborough, Cambridgeshire.
3 Chingford & District MEC, Final Work Night (Winter Put-Away), Ridgeway Park, Chingford, London.
4 Leyland SME, 'The Sectioning of Pender', Talk by Doug Turner, The Conservative Club, Towngate, Leyland, Lancashire.
4 Sutton MEC, Bits & Pieces Evening, rear of 1 Chatham Close, Sutton, Surrey.
5 CRAMEC, Evening Steam Up and Barbecue, Waterside Farm Recreation Centre, Somnes Avenue, Canvey Island, Essex.
5 Maidstone MES, Evening Run, Mote Park, Maidstone, Kent.
5 North Norfolk MEC, 'Medical Engineering', Talk by Mr Smith, Social Centre, Avenue Road, High Kelling, Holt, Norfolk.
5 Rochdale SMEE, Auction Night, Castleton Community Centre, Manchester Road, Castleton, Rochdale, Lancashire.
5 Vale of Aylesbury MES, 'Life of a Railwayman on Southern and Eastern Regions', Southcourt Community Centre, Prebendale Road, Aylesbury, Buckinghamshire.
6 Keighley & District MES, Open Day, King George V Playing Fields, Marley, Keighley, West Yorkshire.
6 SMEE, 'Off Shore Oil Platforms', Talk by George Young, Marshall House, 28 Wanless Road, London SE24.
6/7 Newport MES, Simplex Rally, Glebelands Recreational Area, Newport, Gwent.
6/7 Sale Area MES, Open Weekend, Walton Park, Walton Road, Sale, Cheshire.
7 Brighouse & Halifax ME, Open Day, 'Ravensprings', Cawcliffe Road, Brighouse, West Yorkshire.
7 City of Sunderland MES, Autumn Rally, Roker Park, Sunderland, Tyne & Wear.
7 Leyland SME, Open Day, Worden Park, Leyland, Lancashire.
7 National 2½" Gauge Association, Northern Rally, at Stockport & District MES, Royal School for the Deaf, Cheadle Hulme, Cheshire.
7 Royston & District MES, Open Day, Meldreth Manor School, Meldreth, Royston, Hertfordshire.
7 Sutton Coldfield MES, 7¼" gauge Rally, Balleny Green, Little Hay Lane, Little Hay, Lichfield, Staffordshire.
9 Dockland & East London MES, 'Train Driving on the Welsh Highland Railway', Talk by Darrell Evans, Belhus Woods Country Park Visitors Centre, Aveley, Essex.
10 Hull & District SMEE, 'Computers in the Workshop', Talk by B Arridge, YPI Centre, Chanterlands Avenue, Hull, North Humberside.
10 Southampton SME, 'Winchester Preservation Trust', Talk by Capt. Kennedy, Royal British Legion, Bullar Road, Bitterne Park, Southampton, Hampshire.
11 North West Leicester MES, Bits & Pieces Evening, Coalville Labour Club, Bridge Road, Coalville, Leicestershire.
11 Sutton MEC, New Drivers Run, rear of 1 Chatham Close, Sutton, Surrey.
12 Hereford SME, Program Review and Bits & Pieces Evening, Royal College for the Blind, Venn's Lane, Hereford.
12-14 Birmingham SME, National Locomotive Rally, Illshaw Heath Road, Hockley Heath, West Midlands.
13/14 Southall Railway Centre, Railways at War, adjacent Southall BR Station, London.
14 Cambridge MES, Public Open Day, Fulbrooke Road, off Grantchester Road, Cambridge.
14 Erewash Valley MES, LBSC Memorial Trophy, Fairfax Avenue, Borrowash, Derby.
14 Keighley & District MES, Open Day, King George V Playing Fields, Marley, Keighley, West Yorkshire.
16 Chesterfield & District MES, 'A1 Locomotive Trust' Talk, Friends Meeting House, Ashgate Road, Chesterfield, Derbyshire.
17 West Riding SLS, Projects under Construction, Freedom House annex, Unison House, Bradford Road, Tingley, near Wakefield, West Yorkshire.
18 Leyland SME, Project Night, Talk by Doug Turner, The Conservative Club, Towngate, Leyland, Lancashire.
18 Sutton MEC, Stationary Engines Run-Up, rear of 1 Chatham Close, Sutton, Surrey.
19 CRAMEC, Seen on the Table, Waterside Farm Recreation Centre, Canvey Island, Essex.
19 Rochdale SMEE, Members' Bits & Pieces Night, Castleton Community Centre, Manchester Road, Castleton, Rochdale, Lancashire.
20 Malden & District SME, Family Day and Night Run including barbecue, Claygate Lane, Thames Ditton, Surrey.
20/21 7¼" Gauge Society, AGM, Uckfield MRC, Bentley Wildfowl Park, Halland, near Lewes, East Sussex.
21 Bedford MES, Traction Engine Rally, Rook Tree Farm (Summerfields), near Haynes, Bedfordshire.
21 Cambridge MES, Model Traction Engine and Road Vehicle Rally, Fulbrooke Road, off Grantchester Road, Cambridge.
21 Chesterfield & District MES, Efficiency Trials, Community Centre, Hady Hill, Chesterfield, Derbyshire.
21 Guildford MES, Locomotive Efficiency Competition, Stoke Park, Guildford, Surrey.
21 Stafford & District MES, Open Running Day, County Showground, Weston Road, Stafford.
21 Stoford MLS, Official Opening of Track, Henstridge, near Templecombe, Somerset.
23 Sutton Coldfield MES, Bits & Pieces Evening, Wylde Green Library, Wylde Green, Sutton Coldfield, West Midlands.
24 Hull & District SMEE, 'Charlatan', Talk by D Leeson, YPI Centre, Chanterlands Avenue, Hull, North Humberside.
25 Sutton MEC, Steam-Up, rear of 1 Chatham Close, Sutton, Surrey.
26 Hereford SME, 'Development of the Steam Engine', Talk by David Hulse, Royal College for the Blind, Venn's Lane, Hereford.
26-28 Bristol SMEE, Model Engineering and Hobbies Exhibition, Brunel Exhibition Centre, Bristol Temple Meads Railway Station, Bristol.
26-28 Centurion SME, 1997 International Steam Meet, Kwikkie Crescent, off Embankment Road, Centurion, Pretoria, South Africa.
27 Birmingham SME, Afternoon Steam Up, Illshaw Heath Road, Hockley Heath, West Midlands.
27 National 2½" Gauge Association Autumn Rally, Surrey SME, Mill Lane, Leatherhead, Surrey.
27/28 North London SME, Model Engineering Exhibition, Barnet College, Wood Street, High Barnet, North London.
28 Cambridge MES, Visiting Clubs Day and Members' Running Day, Fulbrooke Road, off Grantchester Road, Cambridge.
28 Keighley & District MES, Open Day, King George V Playing Fields, Marley, Keighley, West Yorkshire.
28 Whitchurch (Cardiff) & District MES, Open Day, Heath Park, Cardiff, South Glamorgan.
30 Romney Marsh MES, Clockwise Running, from 3.00pm, 101 Rolfe Lane, New Romney, Kent.

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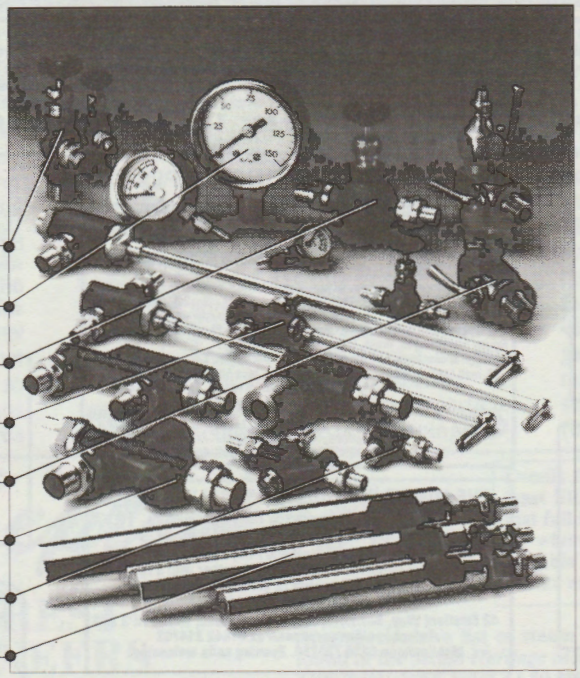

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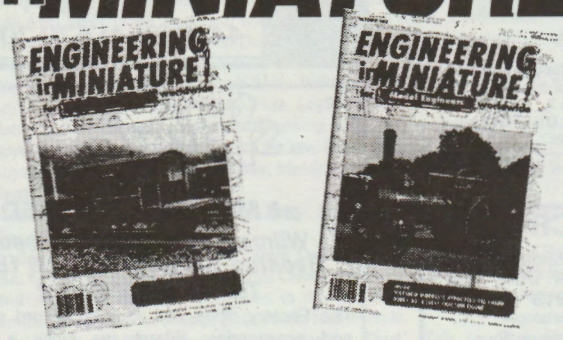

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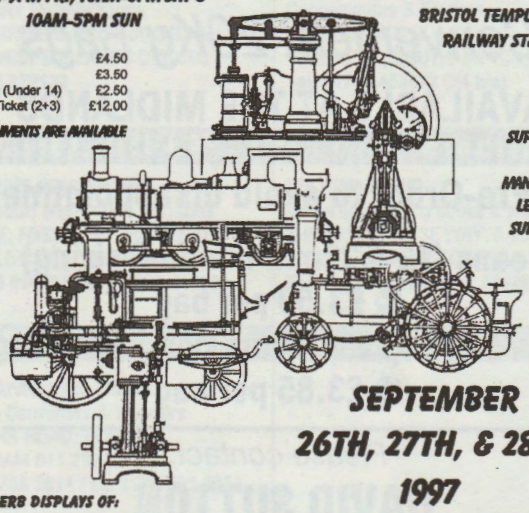

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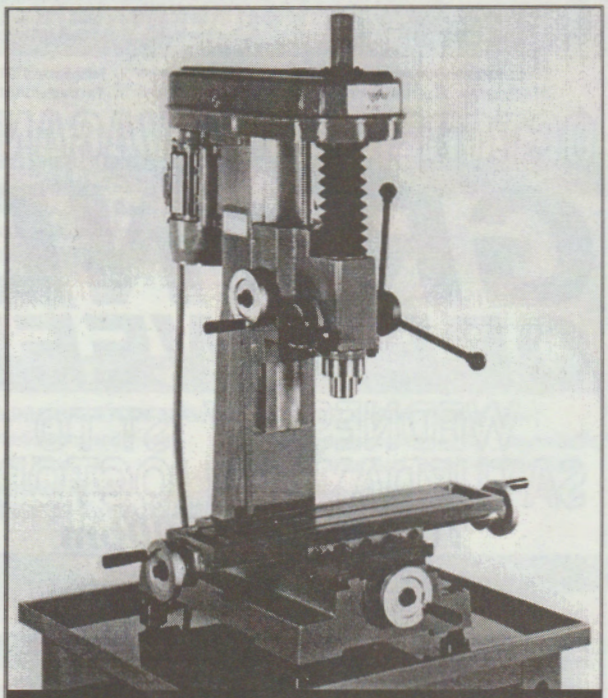

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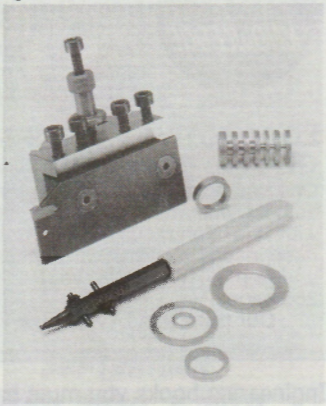

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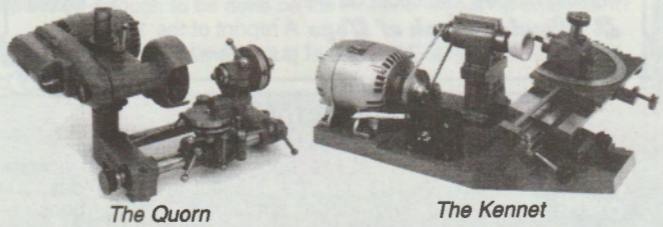

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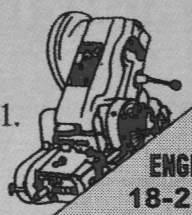


***See us on Stands 65 & 66 at the* MIDLANDS MODEL ENGINEERING EXHIBITION 18-25 October 1997 Castle Donington near Derby**

MISCELLANEOUS /FABRICATION MCH.

BOXFORD Little Giant tool post grinder, boxed £300
GRYPHON 8" bench grinder, 3 phase, as new £165
MYFORD Rodney milling machine attachment £475
BOXFORD 4½" vertical slide (t. slot table) £375
DENBIGH NO.3 Deep throat flypress £375
DENBIGH NO.5 Flypress + stand £425
BUTLER Shaper 24" shaper + vice £1,425
SURFACE TABLES 3' x 2', 4' x 3', 8' x 4' ..... from £200
AJAX 6" Hacksaw, as new condition £475
VANCO 1" Vertical belt linisher, Bench type, 240 volts as new £345
EMCO Dividing head c/w circular 6" table for direct and indirect dividing ..... Choice £300-£345
INGERSOLL RAND/SHERRY & SON compressors ..... Choice £345
GALLENHAMP Muffle Furnace, inside measurements: 6" x 10" x 3¼" high £225
BURNERD GRIPTRU 6 jaw chuck (suit Bantam etc) £245
STAYER TF84 cut-off-saw, 240 volts £320
EXCEL Filer, bench model, 240 volts ..... Choice £175
GABRO Box and Pan/General Purpose Folder, 2ft ..... As New £525
PVE Sine Square ..... As New £120
TOM SENIOR Slotting Head £425
ELLIOT 'OO'/Junior Slotting Head £425
EDWARDS FOLDER 2ft, 16g, Pedestal, model £225
BRIDGEPORT boring heads, two sizes ..... £145/£175
TITANIC shell type milling chuck, 40 int, complete with 15 cutters, boxed upto 6" diameter just £400
KENNEDY NO 60 hacksaw, bench model ..... choice £225
RAGLAN tailstock, almost as new £245
COLCHESTER STUDENT/MASTER Round head, faceplates, small/large ..... £50/£80
ROTARY TABLE, 6" Horizontal/Vertical ..... New £170
SURFACE TABLE, 3ft x 2ft £200
LINMATIC Filer, pedestal model £250
QUALTERS AND SMITH 6" Hacksaw £345
VEHICLE MOUNTED CRANES ..... from £275
FORGE DS130 Ceramic Chip Type £425
BORING HEADS 2/3 Morse, R8 Taper, Max. Cap 4½" ..... New, each £90
EPCO 5cwt Mobile Crane £220
DIVIDING TAILSTOCKS, various ..... Each £50
CLARKSON Radius Att, boxed £425
BANDSAW, 4½" horizontal/vertical ..... New £170
BLACKSMITH'S Leg Vice including stand £75
EDWARDS Guillotine 1m/16g fabricated £950
ANVIL, 1cwt on stand £125
ODONI Machine Bed Clamps (pair) ..... Special £24.50
MYFORD Industrial Stand £300
HEIGHT GAUGES by Chesterman, Shardlow, Moore and Wright ..... From £95
BOXFORD 8" Shaper, complete with vice £475
ABWOOD 6" Universal Machine vice £345
EDWARDS 1.5 metre Guillotine 16BG £950
BOX TABLES 12" x 10" x 9" ..... Each £85
ALBA 10" Stroke Shaper £300
ELLIOTT 10M Shaper, 10" stroke £325
ELLIOTT 5" Universal Dividing Head and tailstock £325
MYFORD Cut-Off-Slide, screw or lever ..... Each £145
SMART AND BROWN H3/H5 Toggle Press ..... £145 / £165
DIE Boxes ..... From £45
TRANSWAVE 3HP Converter ..... New £280
TRANSWAVE 5HP Converter ..... New £350
CROMPTON PARKINSON ¾ HP, resillient mount, Boxford/Myford Super 7 Type motor, ... New £125
DEWHURST TYPE A Reversing switch, ... New £49
TAYLOR HOBSON Model D complete with script £750
RISHTON MILLING MACHINE attachment (for Lathe) ..... As New £750
COLCHESTER STUDENT capstan Attachment ..... As New £575

GRINDING / BUFFING

ABWOOD plough grinder and magnetic chuck £645
CLARKSON MKI Tool and Cutter Grinder £550
CAPCO/SUPERIOR Surface Grinders ..... Each £450
CLARKSON MkII complete on cabinet stand £1,475
CONTELYT CADET 200 (Electrolyte) tool grinder + coolant £475
EAGLE MODEL 2 Surface Grinder, table; 21" x 6" £450
EAGLE Surface Grinder Model **3W** & **Eclipse** Magnetic chuck, 14" x 6" £825
IGAR VICTORIA Surface Grinder + Magnetic Chuck: 18" x 6" Fine Pole, Coolant £1,475
JONES AND SHIPMAN 310 tool and cutter grinder + **universal head** £1,725
MILFORD 12" pedestal grinder £325
PINNACLE MODEL 450A tool and cutter Grinder (current Model) capacity, 8¼" x 16" 1986 ..... £1,275
RJH TRIMTOOL Grinder ..... £125/£145
UNION tool and cutter grinder, universal head, centres etc. £950
VICEROY grinder, pedestal model £145
VICEROY buffers, pedestal models ..... Each £145

DRILLS

FOBCO ½" Bench/Tilting Table £325
HERBERT Pedestal Precision Drill Model **15HA**, 1/16" chuck/ 12,000 revs £400
STARTRITE Bench/Pedestal Models, ½" capacity ..... £200/£250

MILLING MACHINES

V - Vertical, H - Horizontal
ARNO H-V + slotting head £1,650
ASTRA L4 V/H, quill feed Vertical Head, 1" arbor, cabinet stand £1,625
BRIDGEPORT turret mch, belt head/R8, geared table, 42" x 9", collets, clean machine £1,725
BRIDGEPORT Turret mch. variable speed, powered head/R8, 48" x 9" table, coolant, 1976 ..... £3,250
BRIDGEPORT SERIES 1 / 2HP, 42" x 9" table, variable speed head and table, excellent condition ..... P.O.A.
CENTEC 2A Horizontal, swivel 16" x 4¼" table, arbor 1" £580
CENTEC 2B V-H, Quill Feed/2 Morse taper head, almost immaculate, table; 25" x 5" £1,750
ELLIOT JUNIOR, vertical turret, 3 morse head & horizontal £1,200
ELLIOT 181 V, H, table; 28" x 7½" (powered), excellent condition £1,450
EMCO MENTOR, V, 2 morse taper/swivel head, table 20½" x 6" ..... only £950
HARRISON H/V, vertical 30INT head, table 31" x 8", powered machine vice, collet chuck £1,500
HARTFORD TURRET MILL, Quill feed, powered R8 head, table; 42" x 9"1979 ..... £1400
KEARNEY AND TRECKER turret mill £1,750
MARLOW vertical pedestal model, geared head, 3 Morse, Table; 28" x 6½" £950
MYFORD VMC turret mch, belt change head/R8, table; 24" x 6", speeds 160-2540 rpm £1,625
RAGLAN, v. head; 2 morse taper, variable speed, collet chuck £950
RISHTON VH60 bench machine, table 24" x 6", geared 6 speed head Clarkson chuck and vice £2,450
TOM SENIOR MODEL E, Quill feed/2 Morse Taper, table 25" x 4¾", 240 volts £1,850
TOM SENIOR Horizontal table; 25" x 6" arbor 1" bore £575
TOM SENIOR M1 H/V, table 25" x 6"/powered, head; 2 Morse taper/arbor 1" bore, exceptional condition £1,400

LATHES

BOXFORD TUD 4½" x 20" 3 jaw chuck, cabinet stand, hand feeds ..... Only £295
BOXFORD 4½" x 20" model CUD, changewheels, 3 jaw chuck, cab. stand £725
BOXFORD AUD 4½" x 22", gearbox, power cross feed, 3 jaw chuck, cabinet stand and coolant £950
BOXFORD CUD 5" x 22", changewheels, 3 jaw chuck, cabinet stand £950
BOXFORD AUD 5" x 24", (imperial) gearbox, power cross feed, Dickson, Tools £1,400
BOXFORD 1130, 5½" x 30", geared head, gearbox, 3 jaw chuck, collets £1,950
COLCHESTER BANTAM 1600 model, 5" x 20", geared head, power feeds, gearbox £1,400
COLCHESTER STUDENT 6" x 24", geared head, gap bed, power cross feed, 4 way tool post £950
COLCHESTER STUDENT 6" x 24" 1200 (square head) gearbox, well equipped £2,250
COLCHESTER STUDENT 6" x 25" 1800 Models, fully geared ..... each £3,250
COLCHESTER TRIUMPH 7½" x 48" fully geared/well equipped £2,450
HARRISON L5, 4½" x 24", fully tooled, complete with clutch £950
HARRISON 140 5½" x 24", geared head, power feeds, gap bed, 3 jaw chuck, steady £1,250
HARRISON M300 6" x 24" geared head, gearbox, 3/4 jaw chucks £2,450
HARRISON 155 6½" x 25" precision lathe, fully geared, well equipped £1,850
MYFORD ML7 3½" x 19", changewheels, 3 jaw chuck, we have a large selection of this popular model ..... From £725
MYFORD ML7B 3½" x 19", gearbox, 3 jaw chuck etc. £1,250
MYFORD ML7TB 3½" x 19", Tri-lever, gearbox, 3 jaw chuck, 4 way tool post, cabinet stand £1,200
MYFORD ML7 3½" x 31", changewheels, 3 jaw chuck £1,125
MYFORD ML7R 3½" x 31", changewheels, 3 jaw chuck, 3/4HP motor, t/steady, green – hardly used £1,850
MYFORD SUPER 7 3½" x 19", changewheels, 3 jaw chuck, ... Choice £950-£1,150
MYFORD SUPER 7B 3½" x 19", gearbox, 3 jaw chuck ..... Choice £850-£1,400
MYFORD SUPER 7 3½" x 31", changewheels, 3 jaw chuck ..... Choice £1,400
MYFORD SUPER 7, 3½" x 19", 3 jaw chuck, power cross-feed, late model. Choice
MYFORD SUPER 7B, 3½" x 19", gearbox, 3 jaw chuck, cabinet stand, power cross-feed, late machine £2,450
MYFORD SUPER 7B 3½" x 31", gearbox, cabinet stand ..... Just £1,500
PULTRA 1770 70mm x 170mm, 3/4 jaw chucks, collets, vertical slide, V/S inverter, stand £1,475
SMART AND BROWN collet lathe, complete with collets £325

TOO MANY LATHES TO LIST!!

JIG BORERS

BCA MKIII Jig Boring Machine, 8" diameter table, 10 spindle speeds 300-3,250rpm ..... Reduced to Clear £950
DOWNHAM Jig borer, powered quill, table 16" x 7", ¾" capacity excellent £1,950
ELLIOT Mini Borer, collets, powered quill feed head, table 16" x 7" £1,400

All prices exclusive of VAT.

VISA

PRECISION TOOLS/MACHINE SPARES

Access

WE HAVE A LARGE SELECTION OF MACHINE TOOLS AND MEASURING EQUIPMENT FAR TOO MUCH TO LIST.

DELTA

PLEASE RING US WITH YOUR REQUIREMENTS. WE WILL BE PLEASED TO HEAR FROM YOU.

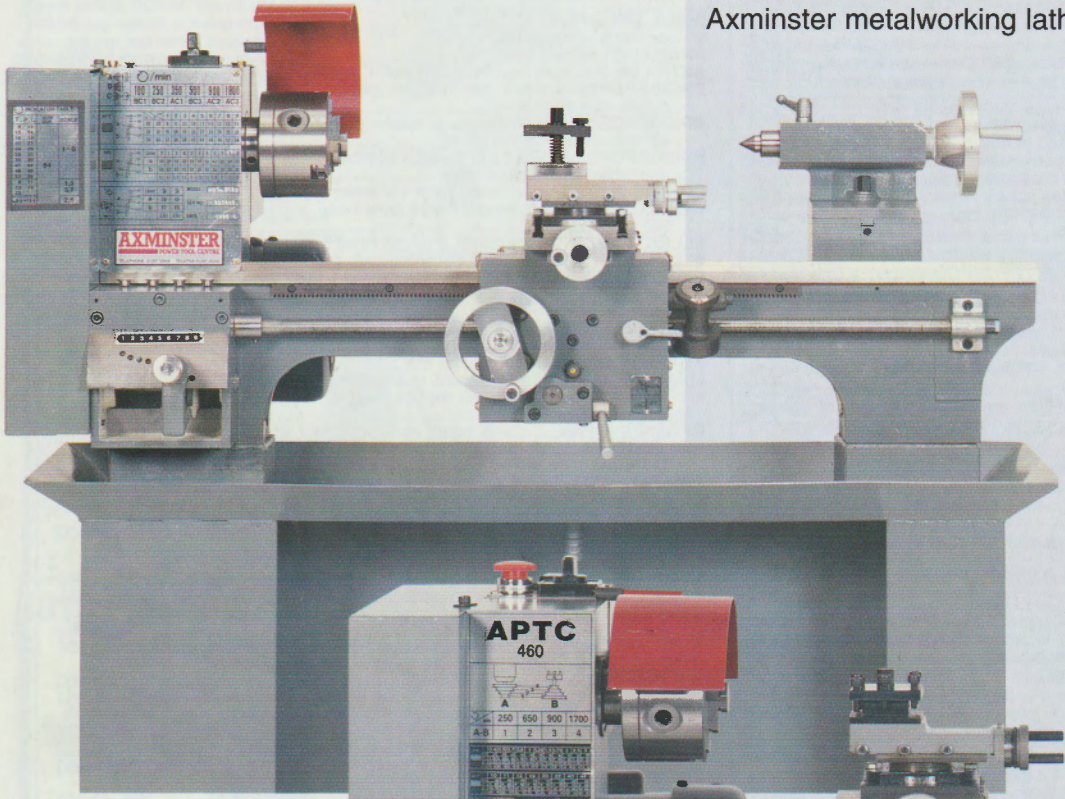
DISTANCE NO PROBLEM!!

SWITCH

APTC Metal Turning Lathes

... it's worth turning your attention to Axminster

There are many variations of these two lathes on the market but be warned they are not all what they seem. However, with Axminster you can be assured of premium quality machines, fully updated to our own specification which conform to all current CE safety regulations and offer outstanding value for money. The APTC 460 is an exceptional little lathe with a cast iron bed which will find a welcome home in any workshop whilst the excellent capacity and versatility of the APTC 9180 make it an ideal model-maker's lathe. Both are superbly accurate and have an extensive range of optional accessories to further enhance their capabilities. All in all, the Axminster metalworking lathes really are the only ones worthy of a second glance.

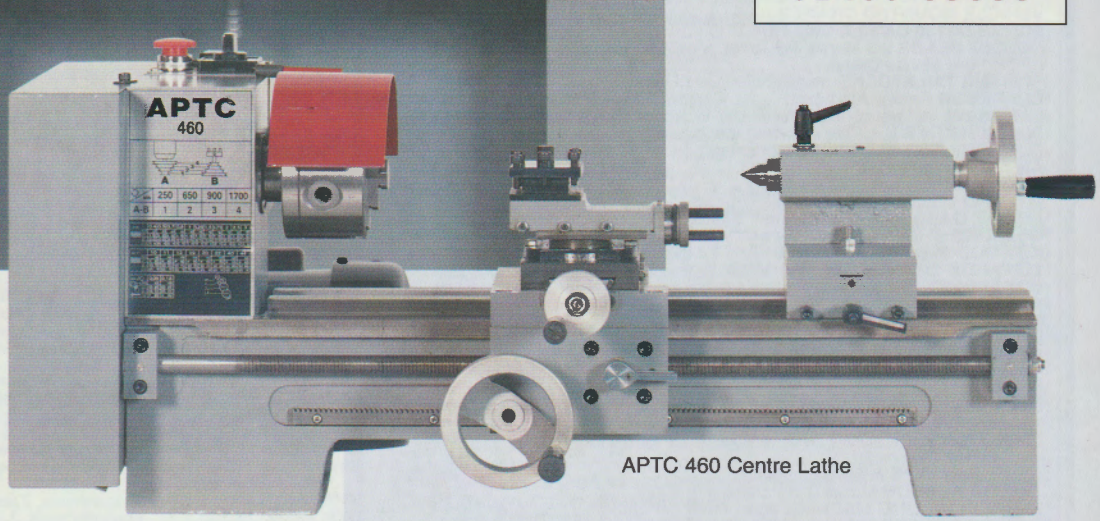


APTC 9180 Centre Lathe

DIARY DATE

The Axminster Tool & Machinery Exhibition
14th - 16th November
Bath & West Showground
Shepton Mallet, Somerset

Ticket Hotline
01460 68686



APTC 460 Centre Lathe

PRICE (All prices include VAT @ 17.5%)

APTC 460 Lathe (Either Metric or Imperial)	£589.95
APTC 460 Slow Speed Attachment	£80.45
APTC 460 Fixed Steady	£40.50
APTC 460 Travelling Steady	£46.61
Carriage Paid (UK Mainland Only)	
APTC 9180 Lathe (Either Metric or Imperial)	£799.00
APTC 9180 Cabinet Stand & Raising Blocks	£169.26
APTC 9180 Fixed Steady	£34.63
APTC 9180 Travelling Steady	£28.52
APTC Delivery	£25.00

For additional accessories please see catalogue

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